DOCTOR OF HEALTH (DHEALTH)

'Hurry! It's an emergency'

Emergency Ambulance Workload: A study of variation in ambulance utilisation between geographical areas in the East of England.

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Emergency Ambulance Workload: A study of variation in ambulance utilisation between geographical areas in the East of England.

submitted by

John William Martin

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Signature of Author ....

John William Martin

Abstract

With an increasing use of health services in England there is a political desire to alter demand patterns and re-design services to reduce spend. With a yearly 4% increase in ambulance service use a variety of generic health education initiatives have been tried to reduce demand with seemingly limited effect. Calling an ambulance when you have a perceived need can be considered a health behaviour and to effectively intervene to alter this behaviour requires an understanding of variation in population use. This study analysed 769,376 emergency calls in the East of England including those not conveyed to hospital by three acuity levels. Population use of the ambulance service was considered in relation to socio-demographic factors derived from the census. A significant regression was found ($F(27,3582)=44.81$, $p<0.001$), with an adjusted R^2 of 0.2469. Population factors related to higher utilisation included age groups 85-90 and 90 & over, mixed and black ethnicity, and those who had never worked or were long-term unemployed. The study examined, using moderated regression analysis, the influence of self efficacy, access to services, general health status and social networks on the relationship between socio-demographics and ambulance utilisation. The findings suggest that access to services and general health status of the population act as significant moderators, but self efficacy and social networks are not significant moderators. Policy interventions suggested involve targeting specific population types related to higher utilisation to manage demand. The original contribution of this study is the further development of understanding ambulance utilisation through the use of large datasets within the English NHS context.

Keywords: Ambulance, Utilisation, Health Belief, Population, Emergency, Demand

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My employers during the period; East of England Ambulance Service, Cambridge University Hospitals, Cambridgeshire and Peterborough NHS Foundation Trust.

"Our greatest weakness lies in giving up. The most certain way to succeed is always to try just one more time"

Declaration of authorship

I, John William Martin, confirm that this dissertation and the work presented in it are my own achievement.

1. Where I have consulted the published work of others this is clearly attributed.
2. Where I have quoted from the work of others the source is always given. With the exception of such quotations this dissertation is entirely my own work.
3. I have acknowledged all main sources of help.
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John William Martin

9th March 2018

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Abbreviations

5YFV - Five Year Forward View

AMOS - Analysis of Moment Structures

AMPDS - Advanced Medical Priority Dispatch System

ARP - Ambulance Response Programme

ATS - Access to Services

CAA - Census Assessment and Adjustment

CAD - Computer Aided Dispatch

CCG - Clinical Commissioning Group

CCS - Census Coverage Survey

CFI - Comparative Fit Index

CKN - Close Knit Neighbourhood

CQS - Census Quality Survey

CSV - Comma Separated Value

DV - Dependent Variable

EEAST - East of England Ambulance Service NHS Trust

EoE - East of England

EMS - Emergency Medical Services

ESRC - Economic and Social Research Council

GDP - Gross Domestic Product

GES - General Efficacy Scale

GHS - General Health Status

GIS - Geographical Information System

GP - General Practitioner

HBT - Health Belief Theory

HBM - Health Belief Model

HRP - Household Reference Person

HSUB - Health Services Utilisation Behaviour

IBT - Illness Behaviour Theory

ITMDEHS - Integrated Theoretical Model of Demand for Emergency Health Services

IV - Independent Variable

LSOA - Lower Super Output Area

MMR - Moderated Multiple Regression

MRA - Moderated Regression Analysis

MSOA - Medium Super Output Area

NHS - National Health Service

NHSP - National Health Service Pathways

NoF - Number of Friends

NS-SEC - National Statistics Socio-economic classification

OA - Output Area

OECD - Organisation for Economic Co-operation and Development

ONS - Office of National Statistics

Popn. - Population

RMSEA - Root mean squared error of approximation

SAF - Same Area Friends

SCT - Social Cognition Theory

SE - Self Efficacy

SEM - Structural Equation Modelling

SES - Socio-economic Status

SQL - Structured Query Language

SS&SN - Social Support and Social Network

TLI - Tucker-Lewis index

TRA&PB - Theory of Reasoned Action and Planned Behaviour

TTM - Transtheoretical Model

US - Understanding Society

UK - United Kingdom

WHN - Willing to Help Neighbours

Chapter 1

Introduction & Context

This chapter outlines the issue of demand for health services and the political drive to provide these services effectively. It introduces the concept that to design services and alter demand profiles requires an understanding of variation in service use by different population groups. The chapter provides the context of ambulance service provision and outlines the aim of this research project as exploring the factors related to ambulance utilisation. Lastly there is an outline of the complete thesis structure.

1.1 Health service demand & design

Health services are established to effectively meet the health needs of a population. A health need can be defined as an objectively determined deficiency in health that requires health care from promotion to palliation (Porta 2008). It is considered a mark of a developed society to effectively deliver health services that meet the health needs of the population (Britnell 2015).

Whilst the structure of services provided to meet these needs varies globally it has been suggested that they share a similar goal; to provide a service that is effective at meeting population health, good patient experience and low per capita costs. The Institute for Healthcare Improvement (IHI) refer to this as the 'triple aim' in relation to delivering health services (Berwick et al. 2008)(See Figure 1-1).

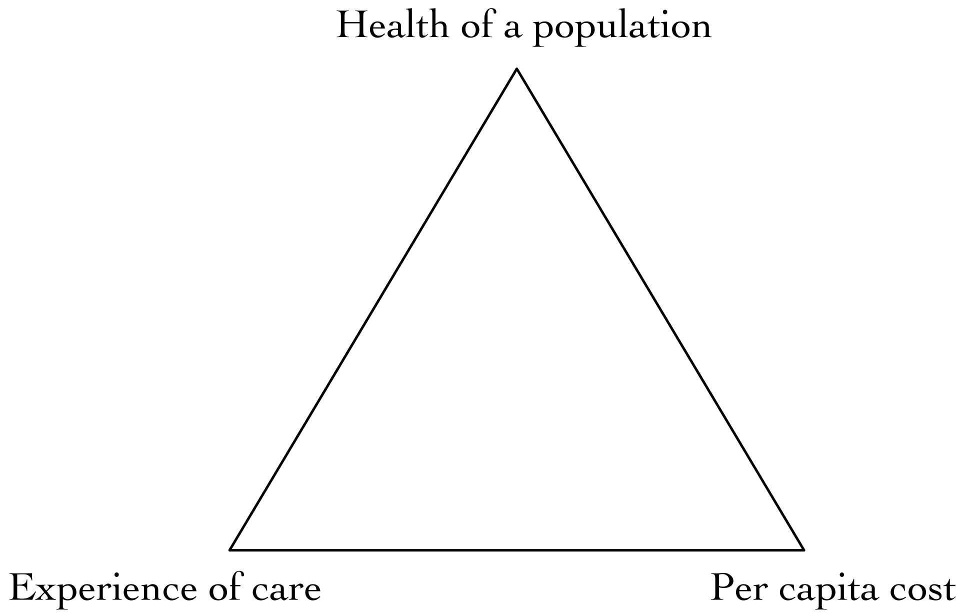


Figure 1-1: The Triple Aim
(Berwick et al. 2008)

As populations continue to grow there is a required increase in service provision, but there is also a global increase in demand for services beyond population increase and profile (Reinhardt 2003). This is reflected in both a global increase in utilisation rates and an associated increase in GDP (Gross Domestic Product) spend on health services by countries (Britnell 2015)(See Figure 1-2).

The increase is also the case within England with the NHS (National Health Service), the government funded health service provision, stating that in 2014–15 there were 600,000 more A&E attendance, 210,000 more emergency admission to hospital and 4.1 million more calls to NHS 111 than in the previous year (NHS England 2014*b*).

This increase in usage and associated increase in required spend creates a political imperative to manage health services effectively, especially in countries where the majority of the spend is by the government through taxation. This component is reflected in the triple aim as minimising the per capita cost, but also reflects that any reduction should not be at the detriment of population health

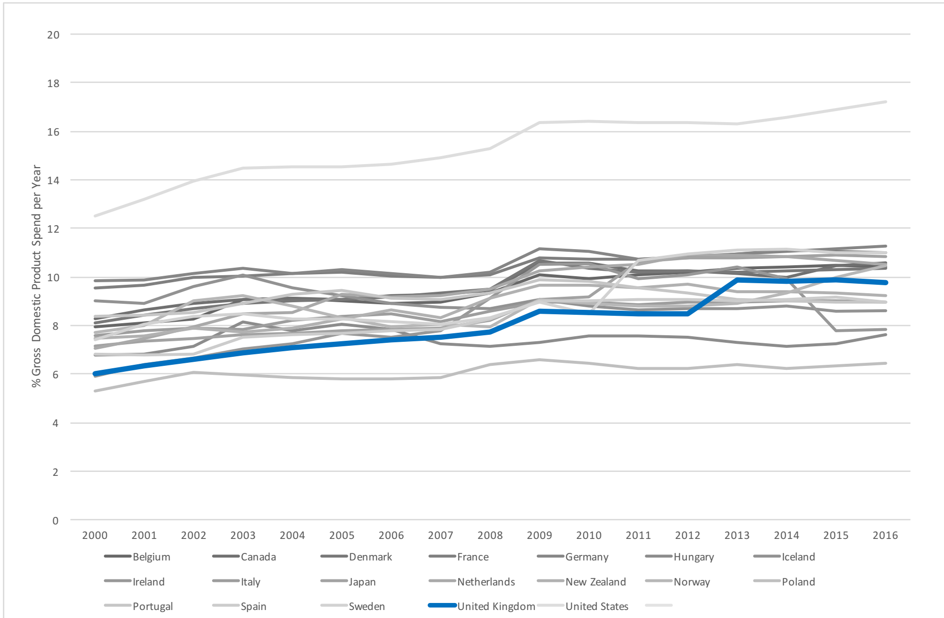


Figure 1-2: Gross Domestic Product (GDP) spend on health 2000-2016 (OECD 2017)

or patient experience. The English NHS, which is funded through taxation, has seen significant political discussion in this area, and successive governments have produced plans that aim to deliver effective services at a low cost.

In October 2014 there was the publication of a 5 year forward view (5YFV) for the NHS outlining the latest direction of travel. This document highlights the achievements of health service provision to date, but also aims to achieve better service provision with a 3% financial efficiency improvement. The key areas of focus for redesign are primary care, **urgent and emergency care**, and maternity services (NHS England 2014*a*).

In line with the triple aim it is clear that there is policy direction within England to redesign services, including urgent and emergency care services, to meet the needs of the population. This redesign is focussed on managing demand more appropriately and to do this will require a clear understanding of the current utilisation so that any proposed interventions are targeted and based on evidence.

In summary, demand for health service provision is increasing globally. Within England the 5YFV outlines the NHS approach to redesigning elements to manage this demand which should be supported by research into demand patterns. This research study seeks to contribute to this knowledge by developing an understanding of utilisation of emergency ambulance services within England.

1.2 Ambulance Services in England

Having identified that urgent and emergency care in England is a key area of focus for redesigning to manage demand, there needs to be consideration given to the service providers for this area. These include emergency departments in hospitals, the ambulance service, the 111 service (a telephone advice service), primary care services, pharmacies and urgent care centres. The focus of this study is the utilisation of the **ambulance service** and this section provides the context of current service provision.

Ambulance services are commissioned to provide an appropriate response to those identifying a health need and directly accessing care through the telephone (999 is a free telephone number available at all times). The services operate a range of response models to patients who access the service. This has developed from traditional double staffed ambulances to now include passing calls to other services such as NHS 111, sending alternative responses such as a single paramedic in a car, altering the level of practitioner sent with increased skills and encouraging more treatment on scene without conveyance to hospital (Ball 2005, Foëx & Walter 2002, Mason et al. 2007, Woollard 2007).

According to NHS public information, ambulance services are designed to "help many people with serious or life-threatening conditions". Whilst this definition of serious conditions is often portrayed by the media the ambulance service currently only categorise 30% of 999 calls as serious or life threatening, and currently 37% of patients are treated without conveyance to hospital (Health and Social Care Information Centre 2012). The prime purpose remains to respond to those accessing the 999 system for assistance but the reach is now beyond just serious or life-threatening conditions. The service is widely used and usage has been increasing. In 1974 the ambulance service responded to 1.5 million calls a year and this has risen to 9.77 million calls in 2016/17 (Health and Social Care Information Centre 2012, Foëx & Walter 2002)(See Figure 1-3).

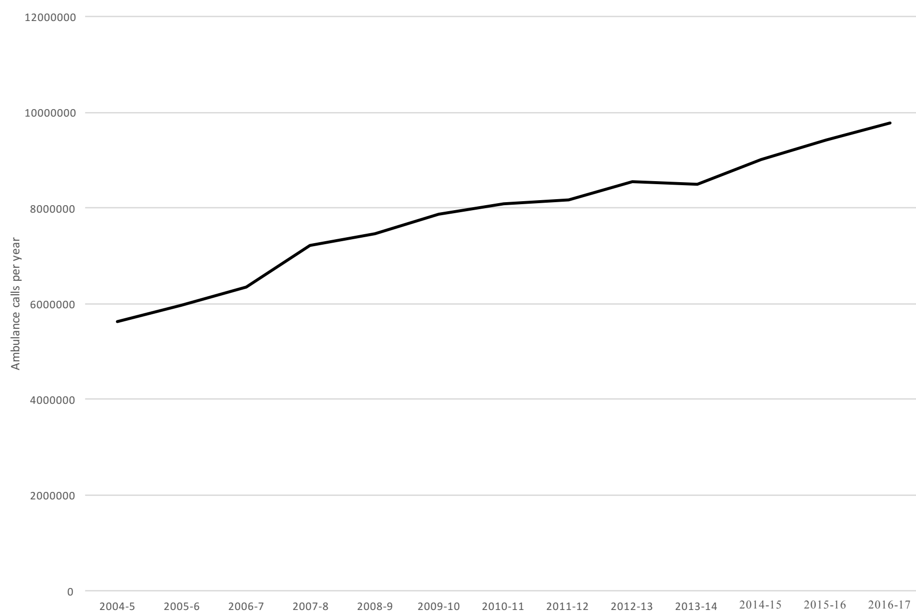


Figure 1-3: Change in ambulance utilisation within England from 2004–2017

This rise has continued and there has been an average 6.5% increase per year in the ten years from 2005 to 2015 (See Table 1.1)(National Audit Office 2017), or a 100% rise compared to a decade ago.

This increase in utilisation is mirrored in other parts of the world and utilisation is shown in some studies to vary between geographical areas (Wrigley et al. 2002, Zakariassen et al. 2010, Reed 2011, Brismar & Dahlgren 1984).

Within England, ambulance services sort (triage) 999 emergency calls into varying acuity levels to enable effective responses and also to measure against Department of Health set standards (Health and Social Care Information Centre 2012). Historically there were three categories (Red, Amber, Green). In 2012 this was changed to six categories (See Table 1.2)(Department of Health 2012).

Table 1.1: Change in emergency Ambulance calls and population size from 2004-2017

Year	Ambulance calls	% change	Population	% change
2004-5	5,623,800		50,194,600	
2005-6	5,960,100	5.98%	50,606,000	0.82%
2006-7	6,333,400	6.26%	50,965,200	0.71%
2007-8	7,225,500	14.09%	51,381,100	0.82%
2008-9	7,447,200	3.07%	51,815,900	0.85%
2009-10	7,867,900	5.65%	52,196,400	0.73%
2010-11	8,077,500	2.66%	52,642,500	0.85%
2011-12	8,157,648	0.99%	53,107,200	0.88%
2012-13	8,544,899	4.75%	53,493,700	0.73%
2013-14	8,485,768	-0.69%	53,865,800	0.70%
2014-15	9,001,274	6.07%	54,316,600	0.84%
2015-16	9,404,676	4.48%	54,786,300	0.86%
2016-17	9,774,493	3.93%	55,268,100	0.88%

In 2017 a further system was introduced; the Ambulance Response Programme (ARP) (Keogh 2017, Turner et al. 2017). There are two approved triage systems within England; the international Advanced Medical Priority Dispatch System (AMPDS) and the local NHS Pathway Systems (NHSP)(NHS Digital 2017, International Academies of Emergency Dispatch 2017).

To cope with this demand increase moving forward there has been widespread policy suggestion that demand for ambulance services needs to be reduced, and that a change in service model is required (Department of Health 2004, Association of Ambulance Chief Executives 2011, Department of Health 2005*b*). A key step needed to support this design change is understanding the demand, and this is recognised by a national research priority recommendation (Snooks et al. 2009).

In summary, ambulance services are established to provide a publicly accessed immediate health care response to an identified health need. Demand for this service is increasing in England and globally and as such understanding how the service is being utilised is fundamental to developing potential policy interventions to manage demand. This controlling of utilisation is necessary for delivering cost effective health provision in the future.

Table 1.2: Emergency Call Categories

Call Category	Description
Red 1	Patients with potentially life threatening conditions; for example a cardiac arrest (requiring an 8 minute response)
Red 2	Patients with potentially life threatening conditions; for example a suspected stroke (requiring an 8 minute response)
Green 1	Patients with serious, but not life threatening, conditions; for example a diabetic condition (requiring a 20 minute response)
Green 2	Patients with serious, but not life threatening, conditions; for example a suspected fractured arm (requiring a 30 minute response)
Green 3	Patients with non-emergency conditions; for example an overdose with no symptoms (requiring a phone assessment within 20 minutes)
Green 4	Patients with non-emergency conditions; for example someone who has fallen with no apparent injuries (requiring a phone assessment within 60 minutes)

1.3 Purpose of this research

Having identified the need to understand utilisation of the ambulance service to support appropriate policy interventions, this research seeks to identify the factors related to ambulance utilisation. It falls within the category of health services research which can defined as: "Health services research is the multidisciplinary field of scientific investigation that studies how social factors, financing systems, organizational structures and processes, health technologies, and personal behaviors affect access to health care, the quality and cost of health care, and ultimately our health and well-being. Its research domains are individuals, families, organizations, institutions, communities, and populations."(Lohr & Steinwachs 2002).

There are multiple other definitions of health services research, but there is a common thread of understanding utilisation patterns and the associated epidemiology, social and behavioural characteristics (Bierman et al. 1968, Flook 1973).

In 2008 a recommendation from a government report (Department of Health 2005*b*) led to a Delphi study of the areas requiring research related to pre-hospital care. Ranked sixteenth was 'Causes and epidemiology of the rise in demand for emergency calls', it was the third priority within the call handling and dispatch category. Also on the ranked list were 'variations and inequalities in access' at place 26, and 'understanding how services are being used' at place 38. Whilst the top ten have been taken forward the focus on **understanding demand** remains an outstanding research area. Priority number six was 'developing interventions to appropriately manage the increase in 999 calls'. To develop interventions requires an understanding of the demand and hence this research aims to contribute to that knowledge base (Snooks et al. 2009).

This study broadly seeks to understand 'how and why the ambulance service is utilised'. Utilising a health provision such as the ambulance service can be considered a health behaviour in response to a need. A number of theoretical models have been developed in this area which broadly follow a pattern of underpinning characteristics leading to a need which in turn leads to a behaviour. In this study the interest is the characteristics and moderators which lead to ambulance service utilisation behaviour (See Figure 1-4).

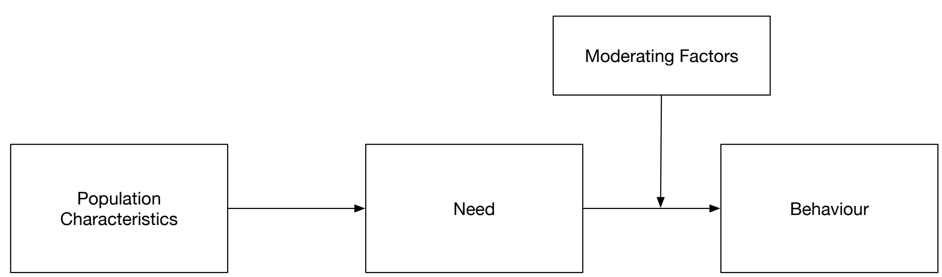


Figure 1-4: Overview concept of health care utilisation theories

Decision making for health behaviours is complex and multi–factorial (Conner & Norman 2015). It is likely therefore that to develop a complete understanding of the behaviour of ambulance service utilisation (use of health services) would require investigation using multiple methods and data sources. There is a need to both identify the characteristics associated with those that utilise the ambulance service, but also to explore why the behaviour (health practice) has occurred, possibly using qualitative techniques. The scope of this study is identifying the population characteristics associated with the health behaviour of ambulance utilisation. This limiting of scope acknowledges that to answer the wider research question would require further study but recognises that studying the population characteristics is a key discrete component.

This study investigates how the population socio-demographic characteristics are associated with ambulance use by varying acuity level. Based on a literature review it will specifically consider:

- Socio-demographic factors including; age, gender, ethnicity, country of birth & socio-economic status.
- Self efficacy
- Social networks
- General health status
- Access to services

The study combines population datasets of characteristics with ambulance utilisation data over a one year period. Moderated regression analysis is used to establish the interactions of factors against types of service utilisation.

The study covers five areas that provide a unique development of the evidence base:

1. It is a contemporary English study in the context of significant demand change since the last substantive analysis in 2002 (Peacock & Peacock 2006).
2. It considers the weighting and interactions of population characteristics.
3. It includes a complete population dataset of patients both conveyed and not conveyed to a hospital by the ambulance service.
4. It analyses how the factors vary by the acuity of the call.
5. It links findings of the factors back to potential policy implications for

demand management and service design.

The limitations of this study include that it relies on ecological correlation, and will therefore report at population rather than individual level. The study is bound by the scope previously outlined so will not research why the characteristics lead to a behaviour change but it will consider possible reasons based on the current literature. The study occurs in the East of England region, and although this covers a 5.7 million population, may limit the generalisation of the findings. The study will focus on aggregated acuity of calls rather than a lower level. Lastly the study uses revealed access, i.e. calling 999 to determine demand, it does not capture the potential un-met need for those not utilising the service.

Health services research should result in recommendations for service design and ideally these should be framed in the context of the triple aim; population health, patient experience and per capita cost (Berwick et al. 2008). The scope of this study includes considering how the findings of characteristics related to utilisation type could support future policy interventions.

1.4 Research aim and questions

The central research question to be addressed in this study is 'What are the factors that determine variation in ambulance utilisation?'

The aim is to develop further a model of understanding of the health behaviour of ambulance utilisation.

To answer the research question the following objectives will be answered.

In relation to three identified acuity levels of emergency ambulance call:

- To what extent do socio-demographic factors account for variation in ambulance utilisation
- To what extent does general health status of a population moderate ambulance utilisation
- To what extent does self efficacy moderate ambulance utilisation

- To what extent does social and support network moderate ambulance utilisation
- To what extent does access to services moderate ambulance utilisation
- Given the findings of the research what are the implications and recommendations for policy setting and service design.

1.5 Thesis structure

This thesis comprises nine chapters which describe the research study.

Chapter 2 outlines the theoretical framework used for the study, defining the concept of utilisation and identifying a model for the basis of analysis.

Chapter 3 presents a scoping literature review of international ambulance service use, considering the individual health need factors, pre-disposing factors and policy factors impacting upon utilisation.

Chapter 4 describes and justifies the methodological approach of this study alongside the data management employed. It outlines the geographical units of study.

Chapter 5 presents an overview of the data collected, the transformations performed and a descriptive analysis of the ambulance utilisation by call acuity.

Chapter 6 outlines the development of models based on the hypotheses established in the research question for each acuity level.

Chapter 7 reviews the findings in relation to previous studies and the theoretical framework. It includes a discussion of the strengths and limitations of the data and methods used.

Chapter 8 considers the findings in the context of policy initiatives that could be instigated to alter the behaviour of ambulance utilisation.

Chapter 9 is the concluding chapter in which the main findings of the study are summarised and outlines the new insights that emerge with recommendations for future research.

Chapter 2

Theoretical approach and conceptual framework

2.1 Introduction

This chapter begins by exploring the theories and models that have been proposed to explain behaviours individuals take in relation to health needs. It then considers the theories within the concept of utilising the ambulance service as a specific behaviour in response to a perceived need. The concept of utilisation as a function of need combined with service access is explained in relation to demand and frames the focus of this study. It concludes by identifying the more recently established Integrated Theoretical Model of Demand for Emergency Health Services (ITMDEHS) as useful for the basis of studying ambulance utilisation within England (Toloo et al. 2011).

2.2 Theories of utilisation behaviour

Theory can be defined as "a set of interrelated concepts, definitions, and propositions that presents a systematic view of events or situations by specifying relations among variables in order to explain and predict events or situations" (Glanz &

Rimer 2008). In this study the behaviour of interest is utilisation of the ambulance service. If this can be considered a behaviour then theories of behaviour are applicable to its study. Such theories attempt to outline the factors that account for variation in behaviour (Conner & Norman 2015).

There are different ways of categorising the theories that are relevant to utilisation. Broadly there is the concept of 'health behaviour' but within this three sub categories can be defined; preventative health behaviour, illness behaviour and sick-role behaviour (Kasl & Cobb 1966). Health behaviour usually refers to preventive practice and actions that individuals take to enhance their physical well-being. As such much of the literature relates to behaviours related to prevention such as stopping smoking, being immunised, exercise and weight loss (Becker 1974). In contrast illness behaviour theory relates to how individuals respond to changes in their body through monitoring and interpreting symptoms. This personal definition of illness leads to decisions related to seeking treatment (Mechanic 1979, 1995, Shaw 1999). Sick role behaviour is specifically related to how an individual who considers themselves ill undertakes activities to get well again (Mechanic & Volkart 1961).

2.2.1 Health behaviour

A number of models have been proposed that consider how individuals respond in relation to health behaviour. Early development was the Health Belief Model (HBM) in the 1950s by social psychologists, and is the most widely used model in health behaviour studies (Rosenstock 2005, Andersen 1968).

It was further extended in 1974 beyond preventative behaviour to consider people's responses to symptoms and this makes it more relevant to ambulance utilisation. The model itself contains a number of primary concepts as to why someone will take action. These are:

- Perceived susceptibility - chances of experiencing a risk
- Perceived severity - how serious are the consequences
- Perceived benefits

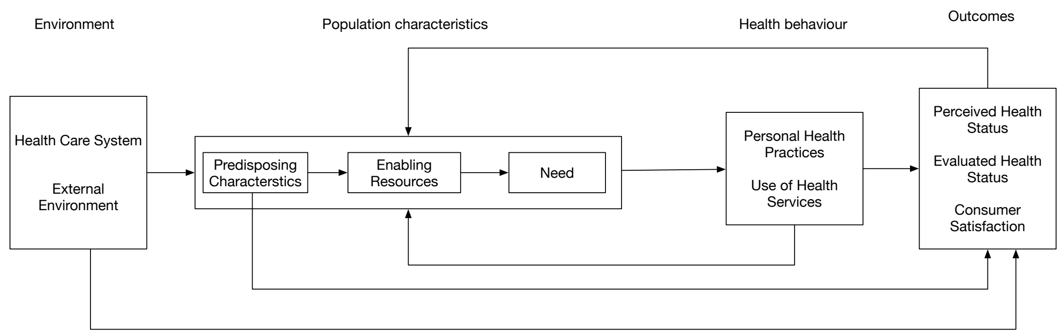


Figure 2-1: Anderson model of health care utilisation

- Perceived barriers - beliefs
- Cues to action
- Self efficacy - confidence in ability to take action

This model underpinned the development of the Health Care Utilisation Model (HCUM) (Andersen 1968, 1995) (See Figure 2-1).

There has since been the development of the Theory of Reasoned Action (TRA). This focuses on a deliberate processing of information in relation to behaviours. It was further developed into the Theory of Planned Behaviour (TPB) and like the health belief model conceptualises changes in behaviour as a consequence of individuals beliefs about outcome or actions (Ajzen & Fishbein 1970, Ajzen & Madden 1986, Ajzen 1991, Ajzen & Fishbein 1980). Models using this approach can explain on average between 40% and 50% of the variance in intention, and between 19% and 38% of the variance in behaviour (Conner & Norman 2015).

2.2.2 Illness behaviour

“Illness behavior: any activity undertaken by an individual who perceives himself to be ill, to define the state of health, and to discover a suitable remedy” (Kasl & Cobb 1966)

Illness behaviour theory relates to how individuals respond to changes in their body through monitoring and interpreting symptoms. This personal definition of illness leads to decisions related to seeking treatment (Mechanic 1995, 1986). It is suggested that like other behaviour, illness behaviour is learned through socialisation. This leads to diversity in responses to illness based on beliefs. A variety of steps are put forward, with the following potentially relevant to ambulance utilisation understanding:

- the visibility, recognisability, or perceptual salience of deviant signs and symptoms;
- the extent to which the person perceives the symptoms as serious (that is, the person's estimate of the present and future probabilities of danger;
- the availability of treatment resources, their physical proximity, and the psychological and monetary costs of taking action (including not only physical distance and costs of time, money, and effort, but also stigmatisation, resulting social distance, and feelings of humiliation resulting from a particular illness decision).

It is suggested that some symptoms are so painful and incapacitating that they inevitably lead to intervention without significant inquiry and likewise that other conditions are so familiar and generally understood as self-limited that they also are dealt with routinely. However, the ambulance service increasingly deals with a wide range of conditions of varying acuity and understanding, therefore exploring different models for different acuity is a possibility. This range of acuities in calls is important as it is suggested that urgent and emergent conditions have been excluded from social study on the basis that in urgent conditions there is little alternative other than to seek health care and this has led to limited studies (Alonzo 1980). To consider this a framework is put forward forward consisting of the following phases in relation to urgent and emergency conditions (Alonzo 1980):

1. Prodromal or warning phase
2. Self evaluation phase

3. Lay evaluation phase
4. Medical evaluation phase
5. Hospital travel phase
6. Hospital evaluation phase

The study of ambulance utilisation more clearly aligns with illness behaviour, but the iterations of health behaviour to include responding to symptoms makes these models useful as well.

2.2.3 Sickness role behaviour

The last sub group of behaviour is the sick-role. This considers activities undertaken by individuals who consider themselves to be ill for the purpose of getting better. There are less models related to this behaviour and it tends to be reserved for longer periods of illness including exemption from normal responsibilities whilst being sick (Mechanic & Volkart 1961). Utilising the ambulance service could be considered a sick-role behaviour.

Health, illness and sick-role behaviour theory all could be considered appropriate for the study of ambulance utilisation especially when studying difference in behaviours for low and high acuity conditions.

2.2.4 Theory integration

The theories outlined in relation to behaviours have some common constructs (Becker 1974, Bandura 1986, Ajzen 1991, Triandis 1977, Kanfer 1970). The authors of the following models collaborated in an attempt to produce a model which integrates the theory:

- Social Cognition Theory (Bandura)
- Health Belief Model (Becker)
- Theory of Reasoned Action (Fishbein)

- Self Regulation (Kanfer)
- Theory of interpersonal behaviour (Triandis)

They identified collectively eight variables which should account for the majority of variance in deliberate behaviour (See Figure 2-2). The environmental constraints, skills and intention were viewed as determinants of behaviour. Where as self-discrepancy, advantages & disadvantages, social-pressure, self efficacy and emotional reaction were factors influencing intention (Conner & Norman 2015).

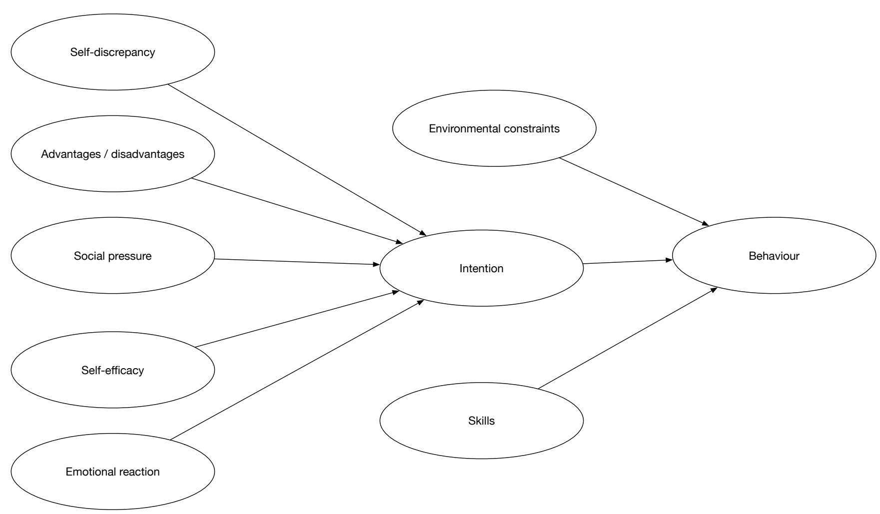


Figure 2-2: Integrated health behaviour theories
(Conner & Norman 2015)

2.3 Study of utilisation

Demand for health care services is a product of those accessing the services. The study of utilisation includes underpinning knowledge of the concept of both need and access (Goddard & Smith 2006). Defining need for health services includes measures of ill health, or proxy related measures that are related to ill-health such as deprivation scores (Oliver & Mossialos 2004). The study of access to health care includes the concepts of availability, utilisation, relevance, equity and quality (Gulliford & Morgan 2003). Both need and access are linked to those outlined in the behaviour models (Conner & Norman 2015). Specifically for the study of ambulance utilisation behaviour there is interest in the factors that lead to making access decisions, resulting in realised access, otherwise known as utilisation (Aday et al. 1975, Penchansky & Thomas 1981).

2.3.1 Need

Need is a central component of health and illness behaviour models and in numerous studies need has been shown to be the greatest factor in determining utilisation rates (Hulka & Wheat 1985). In the context of ambulance utilisation perceiving the condition as warranting an ambulance is key. Belief systems contribute to this perception of need as well as perception of the correct service to access. These beliefs include attitudes, values and knowledge. However, defining appropriate need for healthcare is far from unambiguous (Culyer 1995). Four different aspects of need have been identified in the health care context (Popay & Williams 1994, Sheiham et al. 1982):

- Normative need as defined by reference to medical normality
- Felt need as perceived by the individual
- Expressed need, which is felt need leading to presentation to health care services
- Comparative need, which is established by comparing groups of those responding differently to the same need.

The difference between normative need and felt need is important for ambulance utilisation study as there is a significant focus on inappropriate or misuse (Zachariah 1999, Brown & Sindelar 1993, Palazzo et al. 1998, Snooks et al. 1998). But to define misuse requires a theoretical understanding of the difference between those defining appropriate need. Expressed need is also a fundamental concept as this is the easiest form of need to measure from health service usage rates. A theoretical understanding of how to define an emergency is needed. Whilst defining an emergency may seem like a simple definition, much contention exists in its definitions (Brown et al. 2009, Wolcott 1979, Foldes et al. 1994). It is suggested that health care professionals, individuals and society all vary in their definitions (Wolcott 1979). In a study conducted in America conditions were explored with healthcare workers and lay people to establish a level of agreement on what an emergency is. This demonstrated the variation that can exist (Derlet & Ledesma 1999).

2.3.2 Access

'Access' is a term used frequently in health policy research, but the concept and measurement is complex and multifaceted (Gulliford & Morgan 2003). It can be described as the means through which patients enter the health care system for treatment (Andersen & Newman 1973). Access to the ambulance service requires that both the population has the service available (potential access) and that individuals undertake actions to gain access; help-seeking behaviour (Gulliford & Morgan 2003). Theory of access can be considered from four approaches:

Individualistic approach: This model places the individual at the centre of making the decision to access care through a cognitive process which is influenced by varying factors. Included are some of the earlier identified theories; the protection motivation theory (Rogers 1975), reasoned behaviour (Ajzen & Fishbein 1970), The Health Belief Model (HBM) (Rosenstock 2005) and The Social Behavioural Model (SBM)(Andersen 1968). SBM has developed over time to become a multifactorial model attempting to identify the determinants that lead to the decision to access care (Andersen 1968). This model can be used both to predict and explain use (Andersen 1968, Mechanic 1995, Gochman 1997). It focuses on health care as a function of need, enabling factors and predisposing factors. Predisposing demographic characteristics make someone more likely to require health care, and may include age, gender and deprivation (Hulka & Wheat 1985). This approach centres on deliberate actions as a result of a cognitive thought process. In relation to ambulance calls this raises the question that in an emergency do people take deliberate or spontaneous actions. It has a predictive element, assuming that people from certain groups will usually act in a predicted way.

Social barriers explanations: This approach focuses on five over-arching areas that affect access behaviour; economic, geographic, organisational, knowledge, belief and roles (Gulliford & Morgan 2003).

Patient-orientated approaches: This model moves beyond the individualistic approach of assuming that people will act in a certain way based on demographic factors or social status, to one where variation can alter from patient to patient within a group in relation to help seeking behaviour (Gulliford & Morgan 2003). For the study of ambulance utilisation at population level this approach is interesting as it questions whether groups will act in a predictable way.

Social strategy approach: This approach has developed in response to the perceived limitations of other models in relation to the effect of the social network on decisions to access care. The network is established as a major influence in decision making, it includes the study of cultural routines and habits related to the network (Gulliford & Morgan 2003). These factors can be missing in some of the models outlined in the individualistic approach.

Accessibility of a service is a key factor in its utilisation. The study of access can be seen as both the potential availability or supply of services (potential access), or the measurement of patterns of service utilisation (revealed access) (Penchansky & Thomas 1981). Potential access explores the availability of resources. For ambulance services in England this is straightforward with effectively unlimited resource being available from the patient perspective at the point of call. However, an understanding of the service and ability to use and have access to a telephone do need to be considered, which within the behaviour models would be referred to as an enabling factor.

The theoretical concepts of both access and need are clearly important to the study of ambulance utilisation and need to be considered in relation to the health and illness behaviour models.

2.4 Integrated Theoretical Model of Demand for Emergency Health Services (ITMDEHS)

The previous sections have outlined a variety of ways in which to study health service utilisation. It is clear from these that there is ongoing debate around the factors that lead to varying responses when people become ill. This is especially undefined in the emergency arena, with a range of opinion over the definition of an 'emergency' (Foldes et al. 1994). What does appear to be likely is that a range of factors come together to cause a perceived need that results in the behaviour of calling an ambulance (Toloo et al. 2011). A proposed model for this behaviour in emergencies is the ITMDEHS (See Figure 2-3).

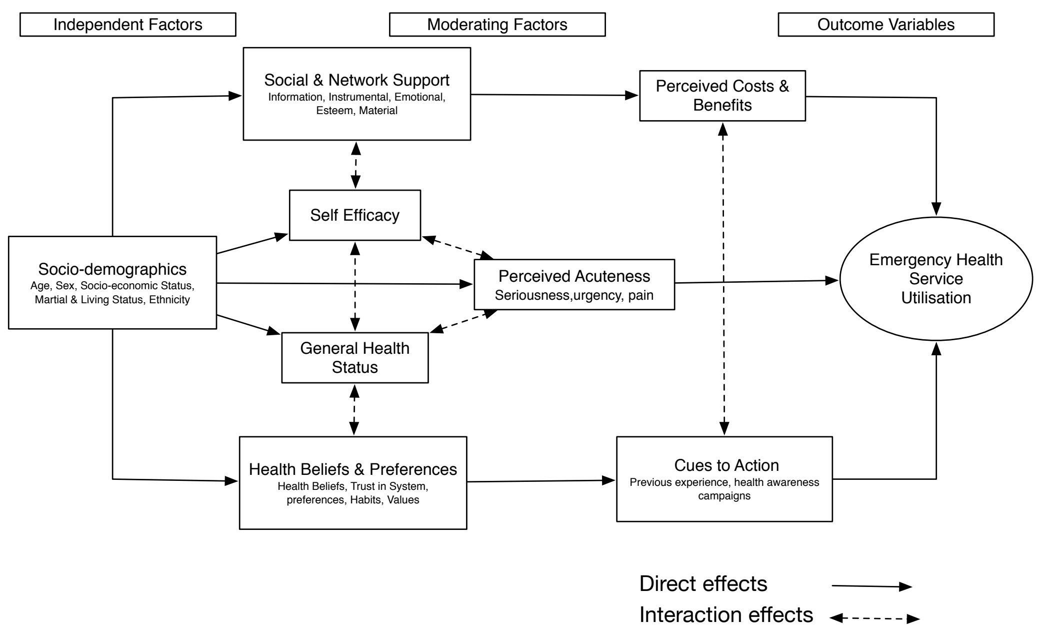


Figure 2-3: Integrated Theoretical Model of Demand for Emergency Health Services (ITMDEHS)

Toloo et al. (2011)

The authors cite that the conceptual framework was developed by considering the Health Belief Model (HBM), Health Services Utilisation Behaviour (HSUB), Theory of Reasoned Action and Planned Behaviour (TRA&PB), Social Cognitive

Theory (SCT), Social Support and Social Network (SS&SN), and cultural determinants of health and health related behaviours. In combination these theories have led the authors to conclude that the decision to take a particular health action, for example using an ambulance service occurs as a function of reasoning and rational choice. This concept is outlined by the theory of reasoned action and involves weighing up the potential threats of the health condition against benefits and barriers as shown in the health belief model. The HSUB model shows that immediate factors are influenced by personal and attitudinal characteristics, such as trust in the efficiency and effectiveness of the system, perceived availability and accessibility of resources. Attitudes include previous experience or cues to action within the health belief model and self efficacy which is defined as one's ability to control the situation and is considered within social cognitive theory. Lastly the model outlines the social context and support network for the individual in taking action. Varying characteristics are associated with all these models including ethnicity, religion, age, gender, and socio-economic status.

2.5 Summary of conceptual framework

In summary there are a number of theories and associated models to explain health and illness behaviour. The Integrated Theoretical Model of Demand for Emergency Health Services (ITMDEHS) provides a proposed combination of these for individual utilisation in emergencies. However, it is not clear within this model what the relevant weightings are of factors, or how applicable the model is to variations in type of usage (acuity of call), although it is likely that similar factors will play a role. Noar (2005) identify that in the exploration of health behaviour theory the next step to moving theory on is the testing of theory against results. This study will utilise components of the ITMDEHS with ambulance utilisation data to carry out this next step and test elements to support developing a model of population ambulance utilisation by acuity level.

This chapter has identified proposed models for how the behaviour variation in ambulance utilisation may be explained. The next chapter will explore previous studies to identify the factors identified in relation to these models.

Chapter 3

Literature review

3.1 Introduction

In chapter two a theoretical framework for the study of ambulance utilisation was outlined based on a number of behaviour models. Literature reviews set out to explore what we already know about a specific topic (Hart 2018). This chapter outlines the scoping review undertaken of the literature to identify specific factors associated with ambulance utilisation to further focus the study.

3.1.1 Literature review framework

The topics explored within this scoping literature review were based on a framework originally constructed for reviewing Emergency Department (ED) utilisation by He et al. (2011) and modified from the health utilisation model (He et al. 2011, Andersen & Newman 1973). The framework provides a way to explore factors based on the behaviour theories previously outlined in Chapter 2. It considers health need factors as a combination of; individual health needs, individual perceptions and societal factors (See Figure 3-1). These areas are framed by predisposing factors and policy factors. The consideration of policy factors is particularly pertinent as a significant amount of the ambulance utilisation literature is international, therefore considering the policy and societal context is important. Policies may for example vary in relation to service structure, funding and cost to the public.

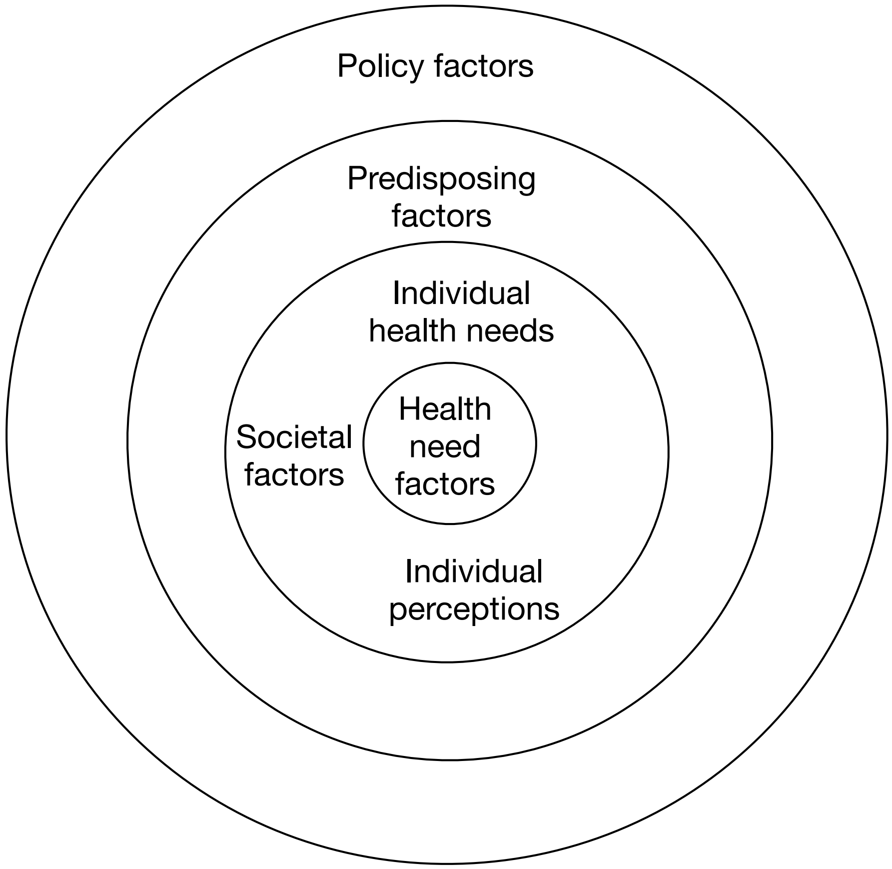


Figure 3-1: Emergency Department utilisation literature review framework (He et al. 2011)

3.2 Literature search methods

A scoping review was undertaken of the literature using a range of search strategies and terms for the topics following the areas covered in the framework.

3.2.1 Search strategies

Electronic databases were utilised to find relevant literature.

The following databases were accessed:

- Medline/Pubmed
- Google Scholar
- CINAHL (Cumulative Index to Nursing and Allied Health Literature)
- SIGLE (System for information on Grey Literature in Europe)
- British Library Integrated Catalogue

Beyond searching the listed electronic databases references were considered from retrieved articles for those missing in the search and then followed up manually.

Department of Health and ambulance service documents known to the researcher were utilised.

3.2.2 Search terms

Search terms are those used to find literature within the electronic databases. Selecting appropriate search terms and combinations are key to finding relevant articles, including consideration of synonyms (Hart 2018). For example the term 'ambulance service' is utilised in England, but within other countries the term is 'EMS' or 'Emergency Medical Services'. Truncation was also used for appropriate terms.

To find relevant articles in each case a term related to ambulance delivered care was included.

The following search terms were used:

- ambulance*
- ambulance service*

- EMS
- emergency medical service*
- pre-hospital care
- paramedic*

The ambulance term was combined with a search related to demand characteristics.

The following search terms were used:

- demand
- epidemiology
- workload
- need
- demography
- demographic*
- socio-demographic*
- sociodemographic*
- use
- utilisation
- utilization

Lastly a search was conducted combining the ambulance terms with those related to health behaviours.

The following search terms were used:

- behaviour*
- behavior*

- health belief*

Initial restriction was related to ambulance services, this was expanded to include other acute services such as out-of-hours and accident and emergency departments. The following search terms were used:

- out of hours
- general practice
- primary care
- accident and emergency
- emergency department

3.2.3 Literature analysis

Following the electronic searches outlined the titles of papers were reviewed. Where they were deemed to be related to utilisation of emergency services the abstract was read. The abstracts were considered against the framework (See Figure 3-1). Where the article related to any of the factors it was included regardless of methodology. No exclusion on year of study was applied, however, they needed to be found within the electronic databases for retrieval. Studies were only included if written in English.

3.2.4 Management of literature

References were initially stored in Papers for mac software. This included the title, author and associated information. Where available a PDF copy of the article was attached. The database was transferred to the Biblatex system for use within Latex for the thesis construction. This stored 280 references.

3.3 Health need factors

Health need factors encompass three areas; individual health needs, individual perceptions and societal factors (He et al. 2011). Collectively these factors create a health need which is perceived to need intervention, and in the context of this study, a need resulting in ambulance utilisation (Becker 1974).

3.3.1 Individual health needs

Individual health needs are those specific to individuals for example chronic disease, acute illness or injury, drug or alcohol dependence. As outlined in Chapter two need is consistently shown to be the greatest factor in determining utilisation rates (Hulka & Wheat 1985). It is however difficult to define and measure (Culyer 1995, Goddard & Smith 2006). There have been a number of ambulance studies describing need as a driver (Schuman & Wolfe 1977, Beillon et al. 2009, Clark et al. 2000, Palazzo et al. 1998). However, the studies do not always discuss where that need arises from, although they do attempt to quantify the appropriateness of the need (Palazzo et al. 1998).

3.4 Individual perceptions

It is not just the individual need that is important for studying utilisation, but the perception of that need and perception of the options available for dealing with the need (Conner & Norman 2015). This notion of perception is clearly outlined within the models of behaviours (Becker 1974, Ajzen & Madden 1986, Bandura 1986). In considering individual perceptions there are a range of considerations; the perceived severity, ability to self control and the weighing up of the benefits of care, cost effectiveness and convenience of any action (He et al. 2011). With the increasing level of demand for ambulance services the theme of inappropriate or misuse is common in the literature (Palazzo et al. 1998, Suserud 2011, Zachariah 1999, Chassin et al. 1987, Richards & Ferrall 1999, Gardner 1990, Morris & Cross 1980). This brings into question how they are identifying what is appropriate need. The titles of papers show a bias towards misuse:

- 'Misuse of the London Ambulance service: how much and why?' (Palazzo et al. 1998)
- 'The problem of ambulance misuse: whose problems is it, anyway?' (Zachariah 1999)
- 'Do the right patients use the ambulance service in south-eastern Finland?' (Suserud 2011)

In these papers 'inappropriate use' has been determined by medical personal. However, studies show that perceptions of an emergency alters between physicians, individuals and society (Wolcott 1979, Derlet & Ledesma 1999). This is a significant limitation when papers conclude a proportion of misuse, as it may be perception that is different. For example, when ambulance crews were asked to assess the appropriateness of calls 40% of 999 were identified as not requiring an emergency response (Victor et al. 1999). The suggested alternatives were 13% perceived as being able to be dealt with by GP service and 2% each for social service, psychiatric service and the police. Other studies have used assessment of patients arriving at hospital to determine if the ambulance was warranted. In these cases the judgement was made by doctors. These identified that only 62% of patients had medically warranted an ambulance (Gardner 1990), and reported that 51.7% of journeys were unnecessary (Morris & Cross 1980). Inappropriate use may be differently defined as low acuity or non-life-threatening. Within England 30% of calls are classed as life threatening (Department of Health 2005*b*) which is similar to other countries, with Norway identifying of 5,105 red emergency ambulance responses 70% were deemed non-life-threatening (Zakariassen et al. 2010). This notion of perception is fundamental to designing a study, especially where recommendations for changes in behaviour are concluded. The majority of studies have utilised medical personal to ascertain the appropriateness of the decision, and thus the appropriateness of the perception (Richards & Ferrall 1999, Morris & Cross 1980, Gardner 1990, Victor et al. 1999). This is not unique to ambulance studies. An A&E department study concluded that 36–60% of patients attending A&E are for GP related conditions and a third of visits were frequent users. However, they found that only 27% of calls were deemed inappropriate when switching to using receptionists as the assessor (Hansagi et al. 1991). Defining who should assess appropriateness is key to the results which will be achieved in any study. The literature also challenges the use of the term 'inappropriate', stating it is more a discordance between the expectations of society and the ambulance service of their role (Krohmer 1999, Brown et al. 2009, Zachariah 1999). Indeed the theories related to reasoned actions would suggest that patients make a conscious decision, and this is suggested even in relation to unscheduled health care services (Porter et al. 2008).

In summary individual perceptions are a critical component of what will determine utilisation behaviour. There is variety in the definition of appropriate need, the perceived severity, ability to self control and the weighing up of the benefits of care, cost effectiveness and convenience of any action.

3.5 Societal factors

Societal factors can include items such as population growth, population ageing, seasonal influence, heat waves, natural disasters and outbreaks of disease, all of which contribute to utilisation via changing health needs. Whilst there is increasing population growth this does not account for the rising demand for ambulance services (Fos & Fine 2000). Weather has been shown to have some impact on ambulance utilisation rates and is more pronounced in affecting the elderly and young (Wong & Lai 2012, Andrey 2010). Another aspect to consider is the society driven attitudes towards illness and its response. There is a suggestion that within western society there is an increasing culture of fear which inflates perception of danger (Füredi 2006). In the context of ambulance utilisation a move towards increasing fear of dying, or the inflation of risk/danger related to something may well impact utilisation rates. Outlined is the common feature of 'disease scares' for example Bovine Spongiform Encephalopathy (BSE) was claimed to take 100,000 lives, however, significantly less have actually died from the disease (Füredi 2006). These types of increased exacerbation of risk may well have consequences for emergency call rates. This interpretation of risk and fear may well be different between different demographic groups. A society's view of dying and medical intervention is another key aspect which may alter ambulance utilisation behaviour. It is suggested that western countries are increasingly medicalising at any cost (Gawande 2015). The prevalence of different religions and associate cultural and societal held beliefs in a population are therefore an area worth exploring. Within the literature there is limited exploration of these factors in relation to ambulance utilisation with most studies considering individuals rather than social population characteristics. Within ecological psychology it has been suggested that behaviours could be predicted more accurately from the situations people are in than their individual characteristics (Barker 1968).

3.6 Pre-disposing factors

Exploring health need factors has identified that understanding need and perception of need within a societal context is important. The variation in physical need and perception of service requirement to meet that need can be considered via pre-disposing factors. These are defined as "those that appear to influence the transition of a patient's health perception into a desire to access emergency health care" (He et al. 2011). Factors are items such as gender, socio-economic status, age etc. Analysis of this type of factor is the most commonly found in studies, presumably as it is easy to collect and measure. The commonest methodology in ambulance utilisation studies is correlations between this type of pre-disposing factors and usage data (Siler 1975, Aldrich et al. 1971, Svenson 2000, Peacock & Peacock 2006, Lowthian et al. 2011).

The literature was explored to identify any pre-disposing factors, regardless of attribution to health need, perceived need or illness behaviour.

3.6.1 Age

Across the studies age is consistently given as a variable associated with variation in ambulance utilisation. For high utilisation the elderly are identified as the key age groups. The extent varies between studies but include the over 50's accounting for 60% of responses and those over 70 accounting for 31% (Zakariassen et al.

2010). Being of an age greater than 65 was a predictor with an odds ratio of 1.95, 95% confidence interval, 1.34 to 2.82. (Rucker et al. 1997). Svenson (2000) identified a usage rate 4.79 times higher for those over 65 (178.5/100/year) and Young et al. (2003) concluded over 65's utilise the ambulance service 3.6 more times than those under 15. Rates of utilisation for those aged 85 years compared with 45 to 65 age group were 3.4 times higher ($P<0.001$) for all types of ambulance calls and 5.2 times higher ($P<0.001$) for incidents of a life-threatening nature (McConnel 1998). Over 65 is the commonest grouping identified for classification of the elderly. There is less consistency with the impact of other age groups. Children under the age of 4 in some studies are identified with disproportionate use (van Charante et al. 2007), and this is mirrored in out of hours calls to General Practitioners (GP) (Turnbull et al. 2008). Work by the Department of Health (2009) indicated that the 20 to 30 age group use the ambulance service more. Age is clearly a fundamental characteristic associated with demand. What is not clear is whether the variation is related to need, perception of need, ability to cope or support structures (Conner & Norman 2015). For the older age group there is a known higher prevalence of health needs (House et al. 1994). However, it is also possible that their perception and response to need is different including those born before the creation of the National Health Service (Britnell 2015). For the 20–30 age group and also the young children there is not an established variation in health need, so this is more likely to be related to self efficacy, fear or beliefs about entitlement (Füredi 2006, Mechanic 1986). Understanding the effect of age on utilisation is clearly important, especially beliefs held which as generations become older will be combined with increasing need and may further alter the pattern of ambulance utilisation (Clark & FitzGerald 1999).

3.6.2 Deprivation

It is known that deprived areas tend to have increased health needs as well as use of services (Tulchinsky & Varavikova 2014), although only a third of ED attendance is explained by variation in deprivation (Milner et al. 1988). Before 2006 England had 32 ambulance services, generally matching county boundaries. It was shown there was a moderately strong correlation with deprivation ($r=0.49$, r=0.53) and a strong correlation with population density (r=0.70, r=0.68) of these geographic areas to ambulance demand (Peacock & Peacock 2006). Within the East Midlands area they concluded that deprived areas call four times more often (196.4 responses per 1,000 of population compared with 47 per 1,000 for the least deprived) (Stephenson 2008). Poverty is highlighted as a factor as is male unemployment, which associates with increases in ambulance usage (Svenson 2000, Siler 1975, Wrigley et al. 2002). In an American study the single most significant factor was employment as a proportion of the resident population for predicting ambulance usage (Siler 1975). NHS direct, a telephone advise service showed that older people living in deprived areas had higher rates of calls (Hsu et al. 2012). It is clear from all these studies that access to health services including the ambulance service is increased from deprived populations. A limitation however is explaining this in relation to the behaviour models. Is it increased need that is causing the utilisation or different health beliefs or support structures? (Conner & Norman 2015)

3.6.3 Gender

It is less clear in the literature that gender makes a difference to ambulance utilisation. In a Japanese study males were shown to be more likely to call for an ambulance when studied by questionnaire (Kawakami et al. 2007), but this does not mean they would do so in practice. In a generic study using case scenarios gender played no statistically significant impact on difference in health seeking behaviour (Adamson et al. 2003). But in other studies related to health behaviour there are indications that females are more likely to seek help than males (Glanz & Rimer 2008). Within General Practitioner out-of-hours services females do account for greater use (Turnbull et al. 2008).

3.6.4 Ethnicity

Ethnicity is less often found as a studied factor in relation to ambulance utilisation. Three studies found identify increased usage from non-whites (Siler 1975, Aldrich et al. 1971, McConnel & Wilson 1999). In a multi-variate study of ED attendances by ambulance, race was not shown to be predictive of usage (Rucker et al. 1997). Again it is not clear in these studies if the increase in usage is related to more physical health needs from those of a specific ethnic background, or as a result of different behaviour from perceived need. For example it was identified that the black population was twice as likely to seek help for chest pain than the white population, but once socio-demographic factors were adjusted for there was no significant difference (Adamson et al. 2003). Whilst ethnicity will be a characteristic related to increased likelihood of some health conditions the behavioural response may also be different.

3.7 Policy factors

Policy factors are an overarching theme as they can impact on everyone regardless of predisposing factors. However, they can also have a disproportionate effect, for example charging for an ambulance has the potential to have a greater impact on the poor (Freund et al. 2003). In relation to ambulance utilisation there are a number of policy areas which are likely to be relevant:

- Access to the service (999)
- Cost of the service (free at point of use)
- Availability of others services (111, GP, Walk-in)
- Media campaigns.

Consideration needs to be given to these both in relation to the UK literature but also the literature explored from other countries. Extrapolating results to the UK from sometimes very different health care systems should be done with care, as unlike biomedical or clinical research, health services research findings should only be compared after taking into account the characteristics of each system.

3.7.1 Access to service

Within the UK there is a universal ambulance service offering access via the 999 telephone system. As outlined in Chapter 2 there are a number of theories related to access. In the case of utilising an ambulance this could include knowledge of the 999 system and ability to access a telephone (Penchansky & Thomas 1981). Whilst using the telephone may be considered simple it is actually a realised barrier to accessing out-of-hours services for older people (Foster et al. 2001). Also there are known differences in rural and urban response times by the public and knowledge of this may affect individual behaviour (Brismar & Dahlgren 1984, Health and Social Care Information Centre 2012). Lack of possession of a car and access to a telephone have been correlated with variation in utilisation which is likely to be related to ease of access (Kawakami et al. 2007, Svenson 2000).

3.7.2 Cost of service

Within England healthcare is free at the point of access, but this is not the case in all countries (Britnell 2015). This policy difference could lead to a difference in health behaviour when comparing ambulance studies as both self-payers and the un-insured account for variation in two international studies (Young et al. 2003, Ting 2006). This may be related to charge at the point of use, or perception of subsequent treatment charges. Within the UK there is universal access to the ambulance service via the 999 telephone number. This universal access is not known to increase overall demand in Australia (Tippett et al. 2012).

3.7.3 Availability of other services

When deciding how to respond to perceived need, considering and weighing up available options is a suggested process individuals undertake (Conner & Norman 2015, Mechanic 1986). If this is the case it is important to consider the alternatives individuals may consider and how accessible these are. Alternative options include 111 call service (previously NHS Direct), GP, walk-in-centre, self conveyance to ED or pharmacy (Gerard et al. 2004, Ismail et al. 2013, Chalder et al. 2003). There is variability in availability of these services and beliefs held as to services offered (Milner et al. 1988). The proximity of the ED facility is seen to be an important factor in predicting hospital attendance (Campbell & Roland 1998). A study of calls to the London ambulance service showed that half of the lower acuity calls were made during times that other services such as GP or social services were available (Victor et al. 1999).

3.7.4 Media Campaigns

Policy decisions relating to health education messages can have an effect on utilisation behaviours (Noar 2005, Glanz & Rimer 2008). However, the impact is not always as anticipated as demonstrated by the stroke campaign within the UK (Dombrowski et al. 2013). There have been many English policy driven media campaigns to reduce ambulance utilisation, but no studies have been found of their effectiveness. Japan did carry out a public awareness campaign on appropriate ambulance use. It is not clear what the campaign highlighted but it was set to discourage inappropriate use. Although a definitive cause and effect can not be concluded from the study the results where that both serious and non-serious calls reduced during the campaign, and no other factors are known to have changed (Ohshige 2008). This policy area is closely linked to the understanding of perception of need. For example Morris & Cross (1980) concludes that "Education of the public is essential to reduce the number of unnecessary ambulance calls. Most do not appreciate what constitutes a medical emergency, nor the expense of transportation by ambulance". This bold assumption is not linked to theory on perception, and it is suggested that perceptions of urgency are known to be unreliable and therefore alternative responses, rather than expecting behaviour change, should be explored (Wrigley et al. 2002).

3.8 Summary

In summary this chapter has explored the literature in relation to ambulance utilisation and identified factors related to; individual health needs, individual perceptions and societal factors. It has shown how these are framed by predisposing factors and policy factors. The majority of the studies focus on the predisposing factors and highlight those correlated with variation in ambulance utilisation and it is suggested that demand for ambulance services is highly predictable based on these (Siler 1975, Aldrich et al. 1971). However, the findings are generally lacking in relation to the underpinning theory identified in chapter two. This lack of exploration of the factors in relation to theory is important. For example age may be a variable which has impact on individual health need and also perception of need from beliefs generated during childhood. Understanding that variables can be observed (for example age) and attributed to a factor which is unobserved (for example perceived need) is an important methodological consideration.

Having considered the breadth of literature the following limitations are apparent:

- There is not a contemporary UK study, this is especially important in the context of significant change in demand and potential changing of society attitudes.
- They primarily focus on patients admitted to hospital rather than those not conveyed (this accounts for up to 50% of ambulance calls in England).
- They use medical professional perception of illness as a measure of acuity rather than individual perception.
- They use correlations without considering interaction of moderating factors.
- Findings are not adequately explored in relation to theory of health and illness behaviour.
- There is limited exploration of factors in relation to acuity of ambulance utilisation.
- There are significant assumptions made related to solutions for changing health behaviour not based on theoretical underpinning from the findings.

In conclusion if the output of research is to further understand how ambulances are utilised, and importantly lead to changes in practice to manage demand, then it needs to be based in the theoretical models of health and illness behaviour. There is a suggestion that healthcare journals and funders are mainly concerned with practical factual research rather than that which develops theory (Alderson 1998). The literature found when exploring this subject supports this view with by far the majority of the literature making no reference to theory of utilisation and illness behaviour or indeed adding to or creating theory. However, to make recommendations on behaviour change requires this grounding in theory.

This chapter has summarised the literature and identified a number of factors associated with ambulance utilisation. What is currently absent is an understanding of the factors in relation to the current English policy setting, the weighting of the factors and interaction with each other. There is also a lack of explanation of how the factors alter in relation to acuity of call, especially considering the whole patient population, not just those conveyed to hospital. This absence frames the need for a new study which will consider socio-demographic factors, health status, social networks, self efficacy and access to services in relation to ambulance utilisation for varying acuity groups.

In the next chapter the methodology for this study will be outlined aiming to address this deficit in the literature by considering English ambulance utilisation data for both conveyed and non-conveyed patients in the context of the acuity of call. To expand understanding on the issue of weightings and interactions of factors, models will be constructed to assess how population socio-demographics are moderated by other factors.

Chapter 4

Methodology

4.1 Introduction

Research is the process of finding a reliable answer to a question and should be designed so that it can successfully answer that question (Stone 2002). This chapter outlines the research design and methodology for the study. It identifies the ways in which ambulance utilisation could be studied and justifies a quantitative population study using regression modelling as an appropriate method. It outlines the data analysis steps and the ethical considerations to answer the research question 'What are the factors that determine variation in ambulance utilisation'.

4.2 Overview

This research utilises the ITMDEHS as the underpinning theory for factors potentially related to ambulance utilisation (Toloo et al. 2011). This overview outlines the relevant concepts within the ITMDEHS linked to the aims and objectives of the study and the datasets that will be used.

4.2.1 Theoretical model

The ITMDEHS was outlined as a theoretical model that could be used in the study of ambulance utilisation (See Figure 2-3). The model proposes the following potential factors related to emergency service utilisation at an individual level (Toloo et al. 2011):

- Socio-demographics (age, sex, socio-economic status, martial and live-in status, ethnicity)
- Social & network support (information, instrumental, emotional, esteem, material)
- Self efficacy
- General health status
- Health beliefs & preferences (health beliefs, trust in system, preferences, habits, values)
- Perceived acuteness (seriousness, urgency, pain)
- Perceived costs & benefits
- Cues to action (previous experience, health awareness campaigns)

This study includes applying the research findings to policy considerations. As such studying at a grouped population level is useful for establishing interventions. Each element of the model was considered for group vs individual significance, and the moderators of self efficacy, general health status and social networks were selected for the study. Access to services based on the literature was also considered to be a geographically dependent factor that may moderate ambulance utilisation. The study sets out to apply data to test the constructed model of the four proposed moderators on socio-demographics in relation to ambulance utilisation (See Figure 4-1).

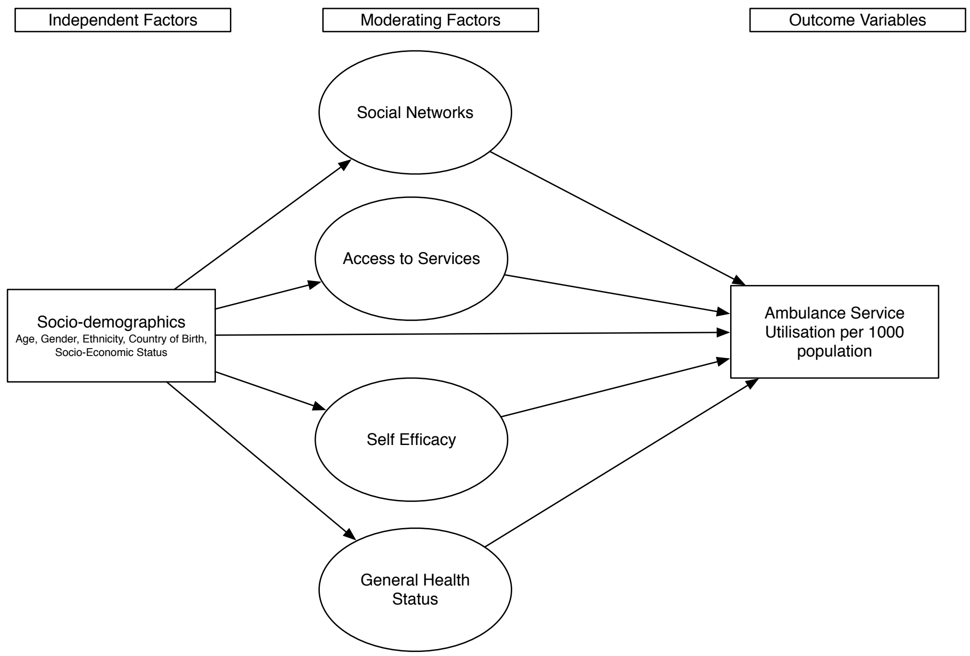


Figure 4-1: Model to be tested

4.2.2 Aims and Objectives

The research question to be answered is 'What are the factors that determine variation in ambulance utilisation'.

With the following objectives:

- To what extent do socio-demographic factors account for variation in ambulance utilisation
- To what extent does general health of a population moderate ambulance utilisation
- To what extent does self efficacy moderate ambulance utilisation
- To what extent does social and support network moderate ambulance utilisation
- To what extent does access to services moderate ambulance utilisation

- Given the findings of the research what are the implications and recommendations for policy setting and service design.

4.2.3 Datasets

To test the model, grouped population data was sourced for each of the factors. Socio-demographic factors and general health status were utilised from the Census. Measures of self efficacy, social networks and quality of healthcare services from the Understanding Society survey. Access to services travel times from the Department of Transport.

These datasets were linked together on common geographical units, Output Areas (See Figure 4-2).

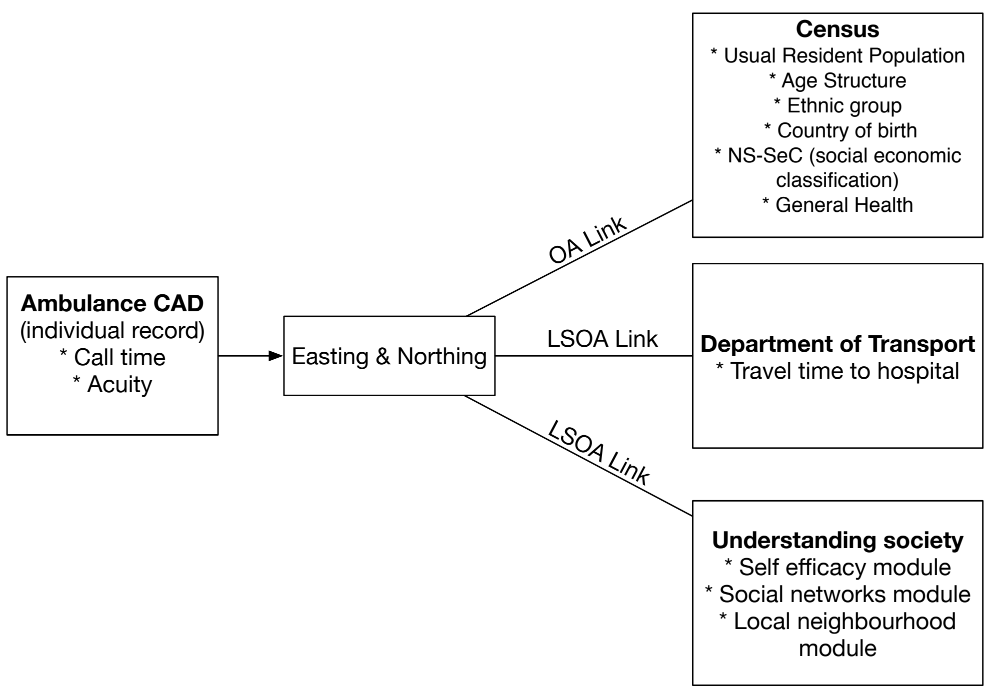


Figure 4-2: Datasets linked within the study

4.3 Research model

In designing research there are a series of logical steps to follow, including justifying why choices are made. Saunders (2011) provides a comprehensive framework known as the 'research onion' that outlines each of the steps. In the following sections each step is considered to justify the selection of a positivist, deductive study using a quantitative cross-sectional population survey to answer the research question (See Figure 4-3).

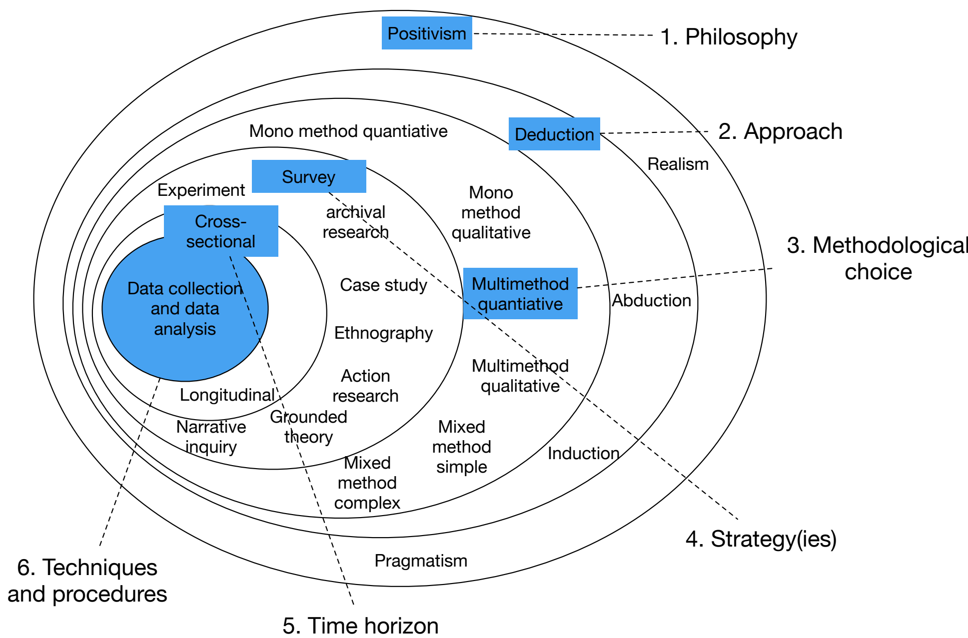


Figure 4-3: Research onion model
(Saunders 2011)

4.4 Research philosophy

Research philosophy considers the logic of inquiry and assumptions made in the research process. These assumptions mainly concern the nature of reality (ontology) and how we can know reality in a particular field of study (epistemology).

Four world-views are described from a set of beliefs; Postpositivism, Constructivism, Advocacy / Participatory, and Pragmatism (Creswell 2009). In the case of post-positivism this is grounded in believing that causes determine effects. In the context of ambulance demand this may mean that age would be measured and assessed, and that it resulted in a specific use of the ambulance service (Phillips & Burbules 2000). This worldview is most aligned to the consideration of using quantitative data on population characteristics to study health service utilisation. The alternative advocacy and participatory worldview was developed to address issues specifically from marginalised groups that could be missed by the positivist view. For example it would examine why age as a factor related to specific groups of society made a difference, and campaign for actions relating to this. The constructivist assumes that meaning is varied and multiple between individuals, so in assessing ambulance demand you may consider that everyone has a different view based on their life experience (Crotty 1998). The pragmatic view develops from the belief that the world is not absolute, it seeks therefore to answer problems from multiple angles to derive theory (Patton 1990). This would mean looking not only at age as a factor but why age may influence choice. This study sought to understand the quantifiable factors related to ambulance utilisation and follows the positivist paradigm.

4.5 Research approach

The approach of any research should be consistent with the research question and it is usual to follow the precedent set for the subject area (Neale 2009). In general the study of health behaviour has followed the classic scientific approach. This empirical research approach generates knowledge from observation or experimentation. Utilising this approach is consistent with the discipline of health behaviour and the proposed research question: 'What are the factors that determine variation in ambulance utilisation?'.

As outlined there are a number of theories related to health behaviour and a theoretical model of emergency service utilisation has been proposed (See Figure 2-3). Deductive research utilises existing theory such as the ITMDEHS in the creation of testable hypotheses. Data are then collected and analysed in order to support or reject the hypotheses (Coolican 2009).

Robson (2002) outlines that deductive research typically involves five sequential stages:

1. Using theory to create hypotheses
2. Expressing the hypotheses in operational terms
3. Collecting data to test the hypotheses
4. Analysing the results to support or reject the hypotheses
5. Developing or modifying the theory.

Based on the review of theory, identification of the ITMDEHS and the previous literature, factors were identified related to ambulance utilisation. The deductive approach to testing these theorised factors in England is an appropriate methodology.

As this study seeks to establish implications and recommendations for policy setting and service design, the scientific approach is advantageous because it allows for replication, extension (application in different contexts i.e. other ambulance services) and comparison (with previous studies)(Coolican 2009).

4.6 Method selection

Selection of the research approach allows the methodology to be developed to answer the research question, 'What are the factors that determine variation in ambulance utilisation'. The categories of method that can be chosen are quantitative, qualitative or mixing of the two approaches (Creswell 2009).

The research question is concerned with calculating the quantifiable impact of factors and therefore the approach outlined is a scientific deductive model. It is common with this approach to test hypotheses using quantitative data (Saunders 2011). In this scientific approach the aim is to support or reject theory by utilising specific data. It is assumed that the researcher is independent and remains objective. The scientific approach requires a highly structured approach that allows replication, in order that findings can be generalised. Using a quantitative method will allow this and will suitably answer the research question.

4.7 Research strategy

Research strategy is concerned with the specific methods that will be employed from the research approach and method selection (Saunders 2011). In-line with the deductive positivist approach a quantitative method will be used that captures the factors potentially related to ambulance utilisation.

Development of theory is based on concepts, and research is conducted to identify and validate these concepts. In relation to ambulance utilisation these concepts include independent socio-demographic factors resulting in perceived need and moderating factors such as social networks and self efficacy. In quantitative research the aim is to identify ways of measuring these concepts via indicators that will stand for the concept. Within this study the indicators are drawn from population surveys and location. In the quantitative approach the relationship between variables will be established.

Ambulance utilisation is the dependent variable for the study. Ambulance services record each emergency call that is received and this can be matched with survey data from various sources that relate to the factors identified from the model. This is secondary data analysis.

4.7.1 Multi-variate statistics

Multi-variate statistics relates to the use of multiple independent and dependent variables. In this study the prime dependent variable is overall ambulance utilisation. This dependent variable can be broken down into utilisation by varying acuity levels, which has not previously been studied. The independent variables consist of measures related to the concepts from the underpinning theoretical models. Within multi-variate statistics a range of techniques can be selected to study how the variables relate to one another (Tabachnick & Fidell 2013).

4.7.2 Secondary data

Having identified the collection of quantitative variables as the required method, consideration was given to the potential sources of data. 'Big data' is a developing methodology which has been widely used in marketing and economic studies. It is now being used within healthcare including emergency medicine. Big data focusses on analysing datasets that are collected to cover whole populations rather than sampling for a specific study (Mayer-Schonberger & Cukier 2013). It is particularly useful for the study of ambulance utilisation as acquiring data within the emergency setting has significant ethical issues due to the environment. For example it would be inappropriate to ask questions in relation to self efficacy whilst attempting to treat an emergency patient. Big data has been identified as a key opportunity for emergency medicine, being able to produce high-quality research at a fast pace, cost effectively and to analyse data from different perspectives (Wong et al. 2015). Due to the emergency setting this study utilised the approach of secondary data analysis with three large datasets alongside the ambulance dataset to test the theoretical concepts.

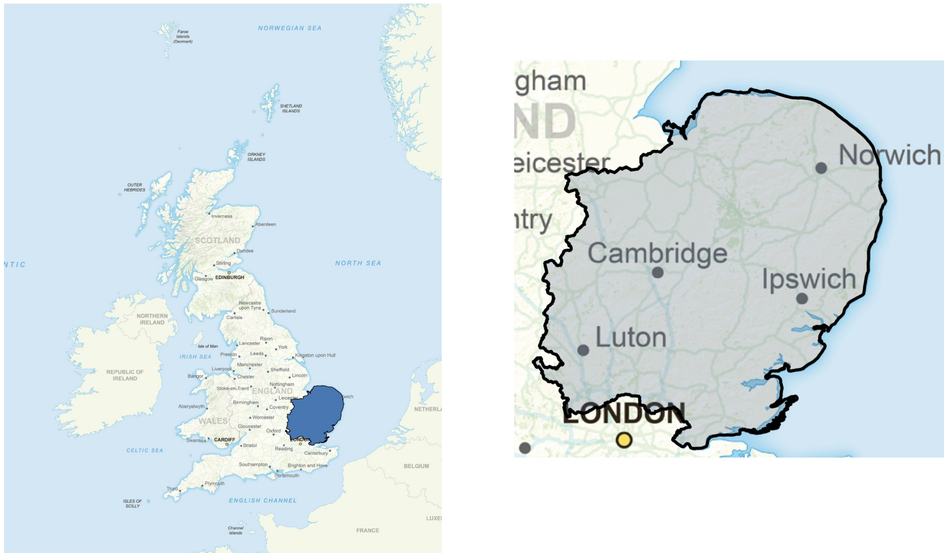
4.7.3 Study area

Within England there are 10 NHS ambulance services (See Figure 4-4). Apart from London these each serve a mixed urban and rural geography with a range of socio-demographic characteristics. Therefore selection of any could be appropriate to explore factors. The East of England Ambulance Service (EEAST) was utilised as both research funding was available and the researcher was familiar with the area. EEAST formed in July 2006 from the merger of three former Trusts covering the counties of Bedfordshire, Cambridgeshire, Hertfordshire, Essex, Norfolk and Suffolk (See Figure 4-5). The region covers 7,500 square miles and a population of 5.9 million, spanning both urban and rural settings and a range of socio-demographic characteristics. EEAST mirrors the national trend of increasing demand and during the study year emergency calls to EEAST were 749,788.

Figure 4-4: Map of Ambulance Services coverage in England

4.7.4 Unit of analysis

Consideration needs to be given to the unit of analysis. In studying health behaviour it is common to study at the individual level. But within the emergency setting acquiring specific information from individuals is problematic. At the time of this study full demographic factors were not collected at the individual patient level within ambulance records.



(a) EoE in UK (b) EoE Expanded

Figure 4-5: Study area - East of England

An alternative when data are not available at individual level is an ecological study which involves the observation of groups or populations rather than individuals (Bonita et al. 2006).

This has the advantage of being able to utilise large datasets already acquired. Studying at a population level is also desirable if you aim to influence health policy (Fos & Fine 2000, Abramson & Abramson 2001). This is because in general public health interventions, although affecting individuals, are established at population level.

Having decided to study at population level a decision on the unit of population is required. Within England health is commissioned via Clinical Commissioning Groups (CCGs). These groups serve varying sizes of population. Within the East of England there are 18 covering the 5.7 million population. This small number means that each area covers a wide range of population characteristics, and would therefore not give the specificity required. Other geographic units include output areas and electoral wards. Output Areas (OA) were created in 2001 and unlike electoral wards aim to group similar households together in comparable size units. Output areas can be aggregated into higher geographies including CCGs. Output areas contain between 40 and 250 households (See Table 4.1 and Figure 4-6).

Table 4.1: Population size and household numbers for geographical areas in the East of England (OA, LSOA, MSOA, CCG)

Geographical Area	Number in East of England	Minimum Population	Maximum Population	Minimum Number of Households	Maximum Number of Households
Output Area (OA)	18,995	100	625	40	250
Lower Super Output Area (LSOA)	3,614	1,000	3,000	400	1,200
Medium Super Output Area (MSOA)	736	5,000	15,000	2,000	6,000
Clinical Commissioning Group (CCG)	18	N/A	N/A	N/A	N/A

Output Areas are aggregated into Lower Super Output Areas (LSOA) that contain 400 to 1200 households. This level was used for the study as it was a small enough geography to allow linking of variables and all datasets identified were available at this level.

4.7.5 Ecological correlation

In this study population datasets containing aggregate results from the factors of interest were joined together to consider the relationship between ambulance utilisation (dependent variable) and the population characteristics (independent variables). This method is known as ecological correlation as the variables describe group information rather than variables directly related to individuals (Robinson 2009, Geronimus 1998).

The assumption is that the information at population level is reflective of the individuals within it. This methodology has a limitation, known as the ecological fallacy. This occurs when causality is inferred from the identified factors but is not

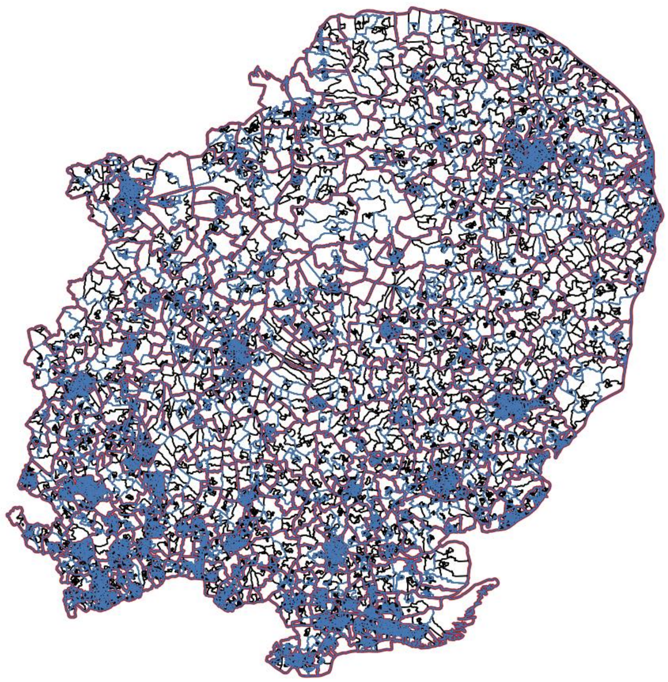


Figure 4-6: East of England Output Area geographies

present. However, in the absence of readily available individual level data and in exploratory studies it can be appropriate (Piantadosi & Byar 1988, Krieger 1992, Robinson 2009, Geronimus & Bound 1996). To mitigate the ecological fallacy small units of correlation will be utilised decreasing the chance of error. Conclusions will also be drawn at the geographical level, rather than making inferences relating to individuals.

4.7.6 Analytical strategy

The strategy for analysing the data aimed to describe the population factors in relation to ambulance utilisation. The strategy used statistical techniques that could identify the correlation and relationship between variables. These were:

- Descriptive Analysis
- Correlation Analysis
- Geographical Analysis
- Regression Modelling

4.7.7 Moderator variables

Within this study the model proposed is that socio-demographics (gender, age, ethnicity, country of birth & socio-economic status) will be related to ambulance utilisation. A number of factors (general health status, social network, self efficacy & access to services) are proposed from the theoretical base that should moderate the effect of socio-demographics on ambulance utilisation. Moderators affect the direction or strength of the relationship between independent and dependent variables (Baron & Kenny 1986). For example the general health of the population may change the effect size of socio-demographics on ambulance utilisation (See Figure 4-7).

Within this study all constructs are assumed to be moderators (general health, self efficacy, social networks & access to services) based on the theoretical framework and previous literature. Some of these are also recognised as mediators in some studies. Mediators account for the relationships between the dependent and independent variables (Baron & Kenny 1986). As they are identified as moderators within the ITMDEHS this was the model that was tested using moderated multiple-regression.

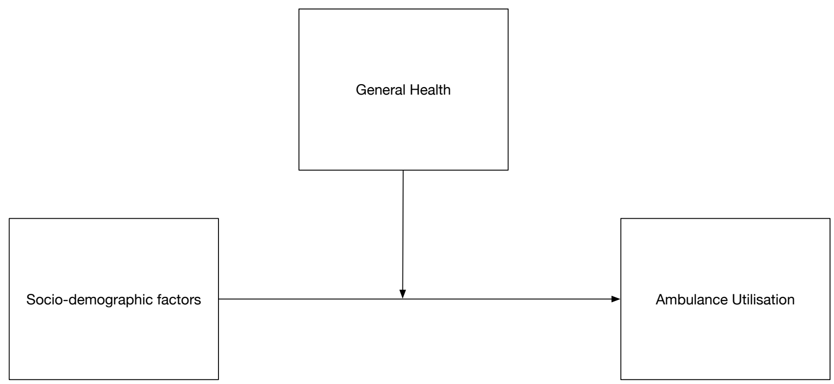


Figure 4-7: Example of moderation

4.7.8 Summary

The research strategy will be to utilise quantitative multi-variate statistics using a large secondary data analysis approach at population level. Ecological correlation will be used with findings reported at population level.

4.8 Time horizon

Time horizon relates to choosing cross-sectional or longitudinal data. In this study the area of interest is variation between areas at a point in time, thus cross-sectional data are appropriate. A longitudinal study would be appropriate if the aim was to explain change in ambulance utilisation over time which was not the purpose of this study.

4.9 Research design - Data collection

The research design has two components; the data collection and the data analysis. This first section will outline the datasets chosen and identify the variables being studied with appropriate rationale.

4.9.1 Ambulance utilisation data

The ambulance service uses a computer aided dispatch (CAD) system to record all emergency calls received. This system populates a database with information on the call location and the type of call following triage. Two systems for triage are approved for use in England; Advanced Medical Priority Dispatch (AMPDS) and NHS Pathways (NHSP). The EEAST uses AMPDS which is an international system originally developed in America. It categorises the patients problem into 32 complaints (See Appendix D) and six acuity response levels (A,B,C,D,E,Ω)(See Figure 4-8).

The CAD system is location rather than patient centric. This means that details of the patient are not collected at the time of the call, just the location. The location is a specific geographical point recorded using Easting and Northing. This is a UK co-ordinate system that creates a grid for matching locations. As the world is not flat, and changes occur there is known error in matching to a flat grid. Standards are designed to minimise this error and the World Geodetic System (WGS84) was used in this study for the geographic matching (Ordnance Survey 2015).

Ambulances are dispatched to the location identified, if on arrival it is not the correct address a new CAD entry is created with new Easting and Northings. Therefore error of location recording should not occur in the data.

All emergency calls received by EEAST during the study year were extracted and inputed into a database for use in the study with the following variables:

- Date and Time of call
- Easting

- Northing
- AMPDS category

The six AMPDS acuity categories were aggregated into three to give sufficient cases in each group (See Table 4.2).

Table 4.2: Aggregated AMPDS Categories

AMPDS Categories	Study Category
Ω + A	Low acuity
B + C	Medium acuity
D + E	High acuity

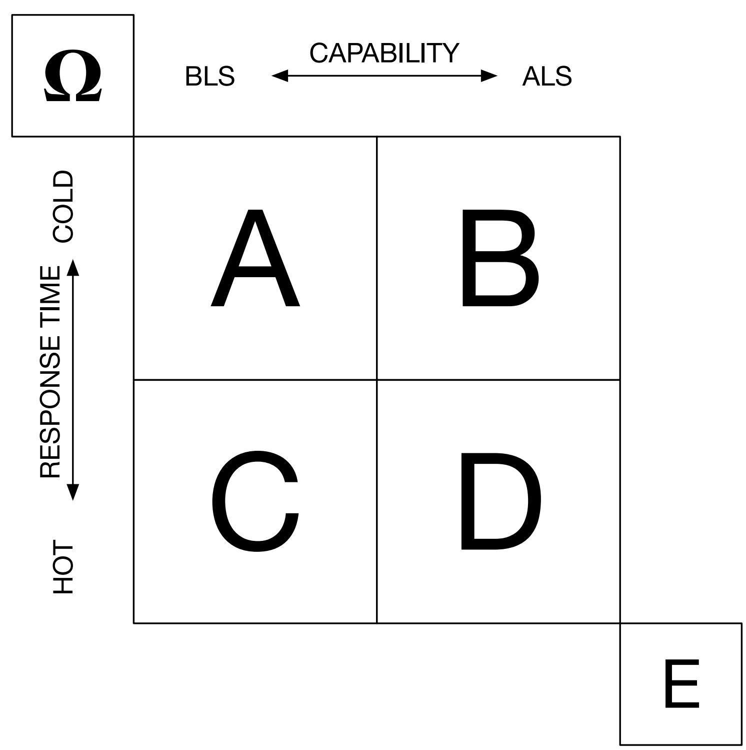


Figure 4-8: Adapted AMPDS response determinant methodology

The ambulance dataset is rigorously quality assured as part of the Department of Health return process. This involves manual checking for duplicate entries which can alter response time figures. The AMPDS license requires routine auditing of call handlers to ensure the algorithms are being followed. The ambulance dataset utilised in this study was post duplicate checking and following compliance with international AMPDS standard. It is therefore considered to be robust in terms of both location and acuity of call with limited errors.

Additional checks where carried out once the data was received to remove non East of England calls and ensure the duplicates had been removed.

4.9.2 Socio-demographics

Socio-demographics refer to the characteristics of a population such as age, ethnicity and gender. These factors are commonly used in group analysis for health studies and there is evidence that both need and behaviour are effected by socio-demographic factors (Gulliford & Morgan 2003).

Within the UK a population wide census is taken every ten years that mandates a return on the socio-demographic characteristics of every member of a household, a fine is in place for non completion. The last census was on the 27th March 2011 and was conducted using a self-completion questionnaire that was returned in the post (Office for National Statistics 2011). Follow up face-to-face interviews occurred for un-returned households (Office for National Statistics 2014*b*).

Within research the quality of the data are important if valid conclusions are to be drawn. The census is aimed to be a complete sample of the UK population. Assuring coverage of the survey and accuracy of the results are vital for use in research. The census sets out to improve the quality of it's data in each iteration, and has a strategy outlying their approach (Office for National Statistics 2009). As a survey the census is subject to error and these can occur in four areas:

- coverage error
- non-response error

- measurement error
- processing error

To minimise coverage error a census coverage survey (CCS) is completed six weeks after census day with the purpose of estimating the number and characteristics of people missed. The undercount does not occur uniformly and so the ONS have developed a Coverage Assessment and Adjustment Methodology (CAA) using statistical techniques to adjust the final dataset. This approach aims to adjust the data but as it is based on a sample is also subject to sampling error. The national population estimate for the census had a 95% confidence interval of +/-0.15% Office for National Statistics (2012).

Response errors are aimed to be assessed through the Census Quality Survey (CQS). This is a voluntary survey carried out with the aim of measuring the accuracy of answers given to census questions by asking a sample of households the census questions again in a face-to-face interview. Answers face-to-face are shown to be more accurate for non-sensitive questions than those on self-completion questionnaires Bowling (2005). The responses are compared and agreement rates calculated which provide an indication of accuracy. These can be quantified as an estimate of respondent error. The figures give a worst case calculation of the accuracy of response. For each of the variables used within the study the estimate of respondent error was considered in interpreting the results Office for National Statistics (2014*a*).

The data was obtained following registration with the UK Data Service as comma separated value (CSV) files by Output Area.

The following socio-demographic factors were identified from the literature and theory review as potentially related to emergency ambulance utilisation:

- Gender
- Age
- Ethnicity
- Country of birth

- Socio-economic Status

4.9.2.1 Gender

Gender was proposed in the ITMDEHS as related to utilisation, but the literature was unclear of impact (Kawakami et al. 2007, Adamson et al. 2003). It is a relevant indicator to be studied, especially in relation to acuity as help seeking behaviours are proposed to differ (Glanz & Rimer 2008).

During census collection each output area has recorded the percentage of resident male and females. These are the two factors that will be utilised in the study. The CQS had high agreement for gender at 99.7%, confidence interval 0.1.

4.9.2.2 Age

Age was noted across studies as being related to utilisation and features within the theoretical models (Zakariassen et al. 2010, Rucker et al. 1997, Svenson 2000, Young et al. 2003, McConnel 1998).

It is a critical factor to be considered within this study.

Age is a derived variable from the Date of Birth which has a high CQS aggrement rating of 98.4%, confidence interval 0.3.

The census outputs include the number of residents for each year of age. To use within a statistical model grouping within age bands is utilised to reduce the number of variables. A commonly used option is compiled by the Census and was utilised in the study:

- 0-4
- 5-7
- 8-9
- 10-14
- 15

- 16-17
- 18-19
- 20-24
- 25-29
- 30-44
- 45-59
- 60-64
- 65-74
- 75-84
- 85-89
- 90 and over

4.9.2.3 Ethnicity

Ethnicity is identified in the ITMDEHS and is related to both different health needs and correlated with different health beliefs (Conner & Norman 2015). Non whites are identified with increased usage (Siler 1975, Aldrich et al. 1971, McConnel & Wilson 1999).

Including ethnicity is an important factor to include. However, ethnic origin does not necessarily correlate with cultural or social upbringing which is related to formation of health beliefs.

The census asks ethnicity in the following groups:

- White: English/Welsh/Scottish/Northern Irish/ British
- White: Irish
- White: Gypsy or Irish Traveller
- White: Other White

- Mixed/multiple ethnic groups: White and black Caribbean
- Mixed/multiple ethnic groups: White and Black African
- Mixed/multiple ethnic groups: White and Asian
- Mixed/multiple ethnic groups: Other mixed
- Asian/Asian British: Indian
- Asian/Asian British: Pakistani
- Asian/Asian British: Bangladeshi
- Asian/Asian British: Chinese
- Asian/Asian British: Other Asian
- Black/African/Caribbean/Black British: African
- Black/African/Caribbean/Black British: Caribbean
- Black/African/Caribbean/Black British: Other black
- Other ethnic group: arab
- Other ethnic group: any other ethnic group

To have a suitable number of variables for study the parent categories were utilised:

- White
- Mixed/multiple ethnic groups
- Asian/Asian British
- Black/African/Caribbean/Black British
- Other ethnic group

Ethnicity has a high CQS agreement of 94.7% at confidence interval 0.8.

4.9.2.4 Country of birth

Health behaviours are proposed to be partly influenced by health beliefs, and these can be informed by cultural background and society values (Langlie 1977). As highlighted whilst ethnicity may be related to health beliefs, it is not a measure of cultural upbringing. Country of Birth determines where you were born and may present an alternative indicator of health behaviours. Country of birth has not previously been found in ambulance studies, or explicitly identified in the theoretical model. The limitation of the variable is that it does not state how long you have lived in the UK, just that you were not born in the UK. Therefore inference of the impact of the other country may be limited.

The following census categories are available:

- England
- Northern Ireland
- Scotland
- Wales
- United Kingdom not otherwise specified
- Ireland
- Other EU member countries in March 2001
- Other EU accession countries April 2011 to March 2011
- Other countries

For the purposes of this research the countries were aggregated into UK, Europe and Other.

The CQS agreement for country of birth was very high at 99.1%, confidence interval 0.3.

4.9.2.5 Socio-economic status

The ITMDEHS identified socio-economic status (SES) as a factor for utilisation behaviours and is therefore included in this study. It is also found in various studies in relation to health behaviours and is linked to deprivation, which was identified in the literature.

Previously two socio-economic classifications have been widely used in UK research; Social Class based on Occupation and Socio-economic Groups. Following a review in 1994 the National Statistics Socio-economic classification (NS-SeC) was formed. This provides an indication of socio-economic position based on occupation. It assigns the individual to a category based on their occupation title and is combined with employment status and recorded supervisory responsibilities (Rose & Pevalin 2002, Goldthorpe & McKnight 2006).

The NS-SEC categories are:

- 1. Higher managerial, administrative and professional occupations
- 2. Lower managerial, administrative and professional occupations
- 3. Intermediate occupations
- 4. Small employers and own account workers
- 5. Lower supervisory and technical occupations
- 6. Semi-routine occupations
- 7. Routine occupations
- 8. Never worked and long-term unemployed
- Full-time students

SES is a derived variable from questions in the census, it utilises the SOC2010 to classify occupation and is derived for the household based on a household reference person (HRP).

The CQS agreement ratings vary in relation to work questions (See Table 4.3).

Table 4.3: Census Quality Survey agreement ratings for workplace questions

Census Question	% Agreement	Confidence Interval Width
Working status in previous week	91.2	0.6
Looking for work	96.2	0.6
Available for work	86.2	1
Waiting to start work	99.8	0.1
Reasons for not working	86.4	1
Ever worked	94.4	0.7
Year last worked	55	1.5
Self employed or employee	94.7	0.5
Occupation Code (Major group)	67.5	1
Supervisor	86.2	0.7
Industry Code (Section)	74.2	0.9
Address of workplace (Post Code Sector)	82.2	1.1

4.9.3 General health status

General health status is a moderating factor identified within the ITMDEHS and need is also identified within the literature as the best predictor of health service utilisation (Hulka & Wheat 1985).

Within the census a general health question is asked and recorded on a standard 5 point scale

- Very good health
- Good health
- Fair health
- Bad health
- Very bad health

The CQS agreement rate is 68.2%, confidence interval of 1.2. This is low with people typically moving to the adjacent category. This is likely due to the subjective nature of how individuals felt at the time, compared with remembering at six week follow up. There is also a known social desirability bias with sensitive questions in relation to face-to-face interviews and this may also be a contributing factor (Grimm 2010, King & Bruner 2000).

4.9.4 Social networks

The theoretical model (ITMDEHS) outlines that self efficacy and social networks should moderate utilisation. The census does not contain information in relation to either self efficacy or social networks. A search was therefore undertaken of the UK data service (www.ukdataservice.ac.uk) which stores a large collection of social, economic and population data. A range of household and individual surveys including; labour force survey, survey on living conditions and the general household survey were considered and Understanding Society (US) was selected for the study as containing variables related to these concepts. US is a household longitudinal study of 40,000 households across the UK. The purpose of the survey is to provide high quality data about health, work, education, income, family, and social life (Knies 2017). The study collects both objective and subjective indicators through yearly interviews with those over the age of 16. The 40,000 households were selected using systematic random sampling which selected 47,520 addresses. Interviewers visited the addresses to identify persons as sample members. The data collection is conducted face-to-face using a computer. US undertake a quality control process to ensure data conforms to the expected structure and specifications, addressing any identified anomalies. The US survey is available to the general public to access (Dataset 6614) but information at LSOA geographic level requires Special Access (Date-set 7248). This was successfully applied for in this study with the project registered with the Economic and Social Research Council (ESRC) reference number 91135 C.

Quality control processes for US include that extensive data checking is undertaken and anomalies followed up.

The social support and social networks theory highlights the extensive influence of social structure on illness status and behaviour (Glanz & Rimer 2008). It is identified as a component in the ITMDEHS.

Constructing a measure of this requires considering within ambulance utilisation what may impact. This was deemed to be a combination of support (willingness to help) and number and closeness of those who could support (Barrera & Ainlay 1983).

The neighbourhood module of US contains the following questions related to close-knit neighbourhoods and neighbourhoods where people are willing to help.

This is assessed using the following statements:

- This is a close-knit neighbourhood
- People around here are willing to help their neighbours.

It is scored on the following scale:

- Strongly agree
- Agree
- Neither agree/disagree
- Disagree
- Strongly disagree

To assess the closeness of the social networks the question 'how many close friends would you say you have?' was utilised. It also assesses what proportion of your friends live in your local area using a 5 point scale.

- All are in the local area
- more than half
- about half
- less than half
- or none?

Data from US is available for anonymised individuals with a geographical identifier, the LSOA. Responses from multiple individuals in an LSOA were aggregated using the mean to form an LSOA indicator. 4,182 individual responses covering 1,419 LSOAs (39.26%) were available for the close-knit neighbourhood and willing to help neighbours questions. 3,077 individuals covering 1,277 LSOAs (35.33%) for number of close friends and 3,754 individuals covering 1,411 LSOAs (39.04%) for friends in similar area.

4.9.5 Self efficacy

Self Efficacy relates to the extent in which people believe they are capable of performing specific behaviours to attain goals. It is the most common feature across the theory for health behaviour (Conner & Norman 2015).

Within the Understanding Society survey there is a self efficacy module which utilise the generalised self efficacy scale (short form) as proposed by Schwarzer & Jerusalem (2010).

This uses 10 descriptive statements:

1. I can always manage to solve difficult problems if I try hard enough.
2. If someone opposes me, I can find the means and ways to get what I want.
3. It is easy for me to stick to my aims and accomplish my goals.
4. I am confident that I could deal efficiently with unexpected events.
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.
6. I can solve most problems if I invest the necessary effort.
7. I can remain calm when facing difficulties because I can rely on my coping abilities.
8. When I am confronted with a problem, I can usually find several solutions.
9. If I am in trouble, I can usually think of a solution.
10. I can usually handle whatever comes my way

Each statement is assessed on the following:

- Not at all true
- Hardly true
- Moderately true
- Exactly true

This study used the information aggregated to LSOA level to form an indicator for area self efficacy. Responses were available for 3,733 individuals covering 1,318 LSOAs (36.47%)

4.9.6 Access to services

Being able to access services is key to the behaviour choices that are made by individuals (Gulliford & Morgan 2003) although not explicit in the ITMDEHS. The ambulance service is easily available, free at the point of use and well known so is not perceived to have access difficulties. Indeed, increasing demand would highlight that it is an easy access choice. This study sets out to consider if ambulance utilisation is changed by accessibility of other services. When considering health emergency situations there are a number of potential alternatives that could be considered such as 111, primary care service, pharmacies, minor injury units and self conveyance to hospital. The choice architecture for making the decision on accessibility could include perception of:

- Availability of the alternative service (opening times)
- Recognition of appropriateness of alternative service
- Quality of the alternative service
- Ability to get to alternative service (transport)

The Department of Transport creates a dataset which provides the theoretical journey times to a range of facilities. The data are calculated by modelling the journey between an origin and destination. It produces travel times for walking, driving, public transport and cycling. In this study as the individual is deemed to be unwell only the public transport and driving datasets were utilised. The car driving dataset is produced using road network and traffic speed information on the TRACC system by basemap. The public transport dataset is produced using publically available information on bus, coach and rail services (timetables). The unit of measurement is minutes and the origin is calculated for the population weighted centroid of the output area moved to the nearest node on the road network.

The GP locations are derived from a list of practices as maintained by the Health and Social Care Information Centre.

The list of hospitals is derived from the Care Quality Commission (CQC) list of active locations. This data was cleansed to remove care homes, non acute providers and specialist trusts, non NHS locations and manually those with a non hospital name.

The limitation of this dataset is that it is theoretical rather than actual and is based on centre of OA. It is an average rather than time specific, and this will have an impact on comparing with ambulance utilisation.

The JTS0505 and JTS0506 CSV files were downloaded for use.

The Understanding Society dataset has questions related to the quality of facilities and accessibility. This rates local area medical facilities on the following scale:

- Excellent
- Very Good
- Fair
- Poor

It also asks the question 'Are you able to access all services such as healthcare, food shops or learning facilities when you need to?' using a Yes / No score.

The combination of travel times and understanding society variables were proposed to measure access to services within the study.

4.10 Research design - Data analysis

Having identified the appropriate datasets consideration needs to be given to data-linkage and analysis.

4.10.1 Data preparation

The ambulance data are a raw download from the ambulance service, so the following cleaning was carried out:

- Removal of non East of England calls
- Removal of duplicate incidents
- Checking data quality

To attain the output area from the Easting and Northing an Ordnance Survey digital boundary map was utilised. The points of the emergency calls were matched using the point-in-polygon method.

The Understanding Society, Census and Department of Transport datasets are available in structured format with clearly identified missing data variables in a supplied data dictionary (See Appendix E)

4.10.2 Data linkage

A secure PostGresSql data-base was established to house all the datasets (Drake & Worsley 2002, Matthew & Stones 2005). It included geo-spatial information for each of the output areas. SQL allows datasets to be combined on common identifiers, in this case the geographical output area (See Figure 4-9 & Appendix F).

A table was created prior to each import for the assigned variables. Following importation a quality check of the data was undertaken.

As geographical areas contain varying population sizes a key linkage was the population. This allowed the creation of ambulance calls per 1000 of the population.

Missing data within Understanding Society was removed.

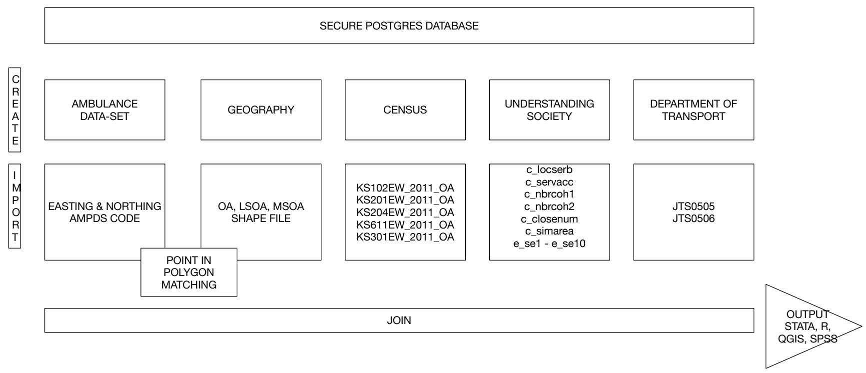


Figure 4-9: Postgres database structure used within the study

4.10.3 Descriptive analysis

The ambulance dataset was checked for quality using the following method (Tabachnick & Fidell 2013):

1. Inspect univariate descriptive statistics for accuracy of input
    - Out of range values
    - Plausible means and standard deviations
    - Univariate outliers
2. Evaluate amount and distribution of missing data; deal with problem
3. Check pairwise plots of nonlinearity and heteroscedasticity
4. Identify and deal with non normal variables and univariate outliers
    - Check skewness and kurtosis, probability plots
    - Transform variables (if desirable)
    - Check results of transformation
5. Identify and deal with multivariate outliers

- Variables causing multivariate outliers
- Description of multivariate outliers

6. Evaluate variables for multicollinearity and singularity

Appropriate transformations were undertaken to account for non-normality.

4.10.4 Spatial analysis

Spatial epidemiological analysis is used to identify variation between areas using geographical techniques. Bailey and Gatrell (1995) created a framework for analysis. This includes the visualisation of data leading to the description of patterns. For the purposes of this study spatial analysis was used to display the data gathered. The variables were displayed on a colour continuum linked from yellow to blue. The produced maps were analysed visually for patterns (Pfeiffer 2008).

To display the data in a way that can be visually useful the QGIS software package was utilised. Data was categorised using the Jenks optimization method (Jenks natural breaks classification method). This is a data clustering method designed to determine the best arrangement of splitting into classes (Jenks & Malecki 2004, North 2009).

4.10.5 Correlation analysis

Correlation is a measure of the extent to which two variables are related. It was utilised as a first stage in this study to consider how ambulance utilisation related to the proposed predictors.

The analysis was conducted using Pearson Product Moment correlation coefficient. The correlation coefficient ranges between -1 and +1 and quantifies the direction and strength of the association between the two variables. Typically a strong correlation is considered to be above 0.5, moderate 0.3-0.5, weak 0.1-0.3.

However, in socio-demographic research, rates lower than 0.3 are common and considered relevant (Field 2009, Harris & Taylor 2008).

4.10.6 Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) was utilised for each of the four moderators to ensure that the proposed latent variables worked as factors. The constructs were based on predicted observed population factors. Good factor structure is indicated by statistical significance of the paths with the indicators, standardised coefficients above .3, and a good model fit.

Good model fit is indicated by Chi^2/df below 5, CFI and TLI $> .9$, and RMSEA $< .08$.

4.10.7 Moderated Multiple Regression analysis

To research the effect of moderators on socio-demographic variables two methods were considered; moderated multiple regression (MMR) and structural equation modelling (SEM).

Regression modelling aims to predict the dependent variable (ambulance utilisation) from one or more independent variables. Models can be constructed and the significance of factors can be assessed (Field 2009).

The model to test is whether socio-demographic factors are related to ambulance utilisation and if these are moderated by self efficacy, general health status, access to services and social networks (See Figure 4-10). An assumption is made based on the ITMDEHS and underpinning health behaviour theory that these will be moderated causal relationships rather than mediated (Jaccard et al. 2003, Toloo et al. 2011).

MMR sometimes referred to as Moderated Regression Analysis (MRA) is an approach that allows the analysis of a moderated casual relationship between variables. In this study it is the relationship between the socio-demographic variable and ambulance utilisation. To undertake the analysis the moderator

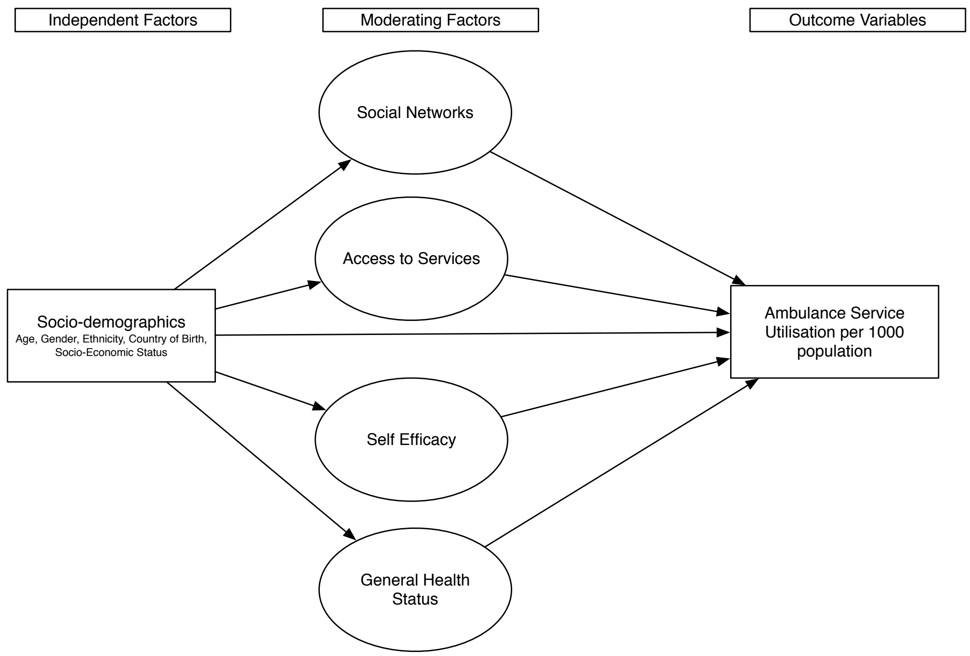


Figure 4-10: Model to be tested

variable is added to the multiple-regression and a subsequent multiple-regression is then conducted with the interactions added. Comparison is made between the two models (Aguinis & Gottfredson 2010).

SEM is a second generation statistical technique which can be used to test hypothesis using a confirmatory approach. Covariance is the basic statistic of SEM and the goal of the analysis is to understand and explain the variation for a specific model (Kline 2011, Anderson & Gerbing 1988, Nachtigall et al. 2003).

As the proposed model to be tested had observable predictors and single moderators, MMR was selected as an appropriate technique.

To avoid high multicollinearity among the independent variables all variables were centred. This was done by converting to z-scores (subtraction of the mean and division by standard deviation). The interaction effects were therefore calculated as products using the centred measures. Significance of interaction effects was used an indication of significant moderation. Regression does not incorporate any assumptions regarding the distribution of independent variables so no transformations were undertaken (Aguinis & Gottfredson 2010, Aiken et al. 1991, Gelman & Hill 2007).

4.11 Ethical considerations

The Research Governance Framework was considered in the development of this study. It places the dignity, rights, safety and well being of participants as the primary consideration in developing research (Department of Health 2005*a*). Two areas have been identified in relation to the framework; Informed Consent and Confidentiality. Approval was sought from the University of Bath Health Ethics Committee and exemption from NHS Ethics (See appendix A & B)

4.11.1 Informed consent

The framework states that informed consent is at the heart of ethical research. However, this study will only use the data collected by ambulance dispatch on patients accessing the emergency service over a period of one year. Due to the nature of emergency situations it is difficult and impractical to obtain informed consent at the time of the incident, as the immediate priority is to treat the patient. All the data used will be that which is routinely collected and informed consent will not be gained. Project information will be made available on the Trust website with contact details and the Trust Patient User Group will be informed.

4.11.2 Confidentiality

All data will be held in accordance with the Data Protection Act on a secure computer with Advanced Encryption Standard (AES) cryptographically protecting the database. All data will be anonymised before publication and if sent for external opinion from outside the research team. The data will be kept for seven years post the conclusion of the study before destruction

4.12 Summary

This chapter has explored the appropriate methodology to use to study the behaviour of ambulance utilisation. It has outlined that to identify the factors related to ambulance utilisation a population quantitative study using regression modelling will be appropriate and add to the existing knowledge base. It will also provide a useful initial stage for further research in a potential explanatory sequential design into understanding ambulance utilisation behaviours.

In summary the method selected is quantitative to fit with a scientific deductive approach based on the current theory into emergency service utilisation. This will provide an original contribution to the UK literature on the factors, including moderators, related to varying acuity of ambulance demand. It will provide the future option of using this study as stage one of a sequential explanatory study into ambulance utilisation.

Chapter 5

Results

5.1 Introduction

This chapter describes the ambulance data and explores variation in utilisation between geographical areas. In identifying variation between areas, consideration is given to the relationship to other datasets relevant to the factors identified in the utilisation literature and theoretical base. It explores the correlation between population socio-demographics, health status, social networks, self efficacy and access to services with utilisation by acuity level. It concludes by summarising the factors for consideration in testing a utilisation model.

5.2 Ambulance dataset

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5.2.1 Overview

The ambulance dataset for the study year contained 769,376 emergency calls. These were matched based on the Easting and Northing to the EoE geography using Postgres. A match did not occur in 19,588 cases (See Figure 5-1). The reason for this is that on occasions calls are routed to the none local ambulance service and also where cross-border cover occurs to minimise response times. Therefore total calls to the ambulance service included within this study were 749,788.

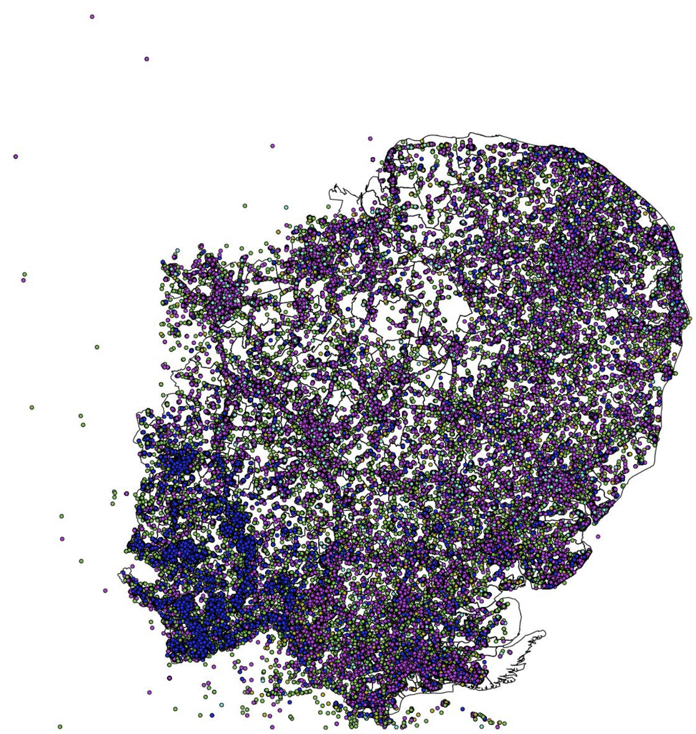
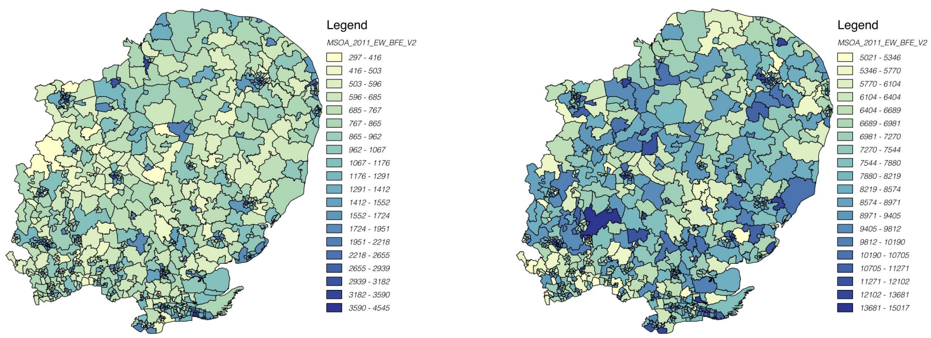


Figure 5-1: Location of ambulance calls across the study year
Note: Line border showing East of England boundary for the study

The population of EoE in the 2011 census was 5,846,965. Average total ambulance utilisation was therefore 128.23 calls per 1,000 of the population per year. This section will explore the distribution of these calls.

To allow matching to the other datasets calls were grouped into geographical areas. This was done using the postgres ST commands to a standard geographical boundary shape file. Three datasets were formed containing the call utilisation rate at OA, LSOA and MSOA level.

As some variation occurs in the number of residents in the geographical areas, standardisation was carried out by dividing the total calls by the resident population for the area and multiplying by 1,000. Within the study ambulance calls per 1,000 of the population was the default dependent variable. Figure 5-2 shows the calls for each of the 736 MSOAs and the census recorded population for these areas. The standardised figure for data used in the study is shown as figure 5-3, the dark blue areas identifying those areas greatest utilisation per 1,000 of the population.



(a) All ambulance calls un-standardised per MSOA

(b) Population per MSOA

Figure 5-2: MSOA population density vs un-standardised ambulance calls

5.2.2 Workday population

The census is carried out based on your home address and reported characteristics are therefore linked to that area. However, during the day a significant proportion of the population migrates to a different place of work. This causes a problem for the method of analysis outlined in this study, as in areas with high migrated populations they may be generating additional emergency calls which would not be matched to the normal characteristics for that geographical area. Such areas include shopping centres, universities, airports etc.

To mitigate for this a second dataset was created for analysis that aimed to reduce the effect. The census enquired of 16-74 year olds where their workplace was and created a workplace population dataset WP101ew.

For example in OA code E00090761 - Queen Edith's, the population is 266 in the census but the workplace population figure is 12,331. This location is in Cambridge and includes Cambridge University Hospitals.

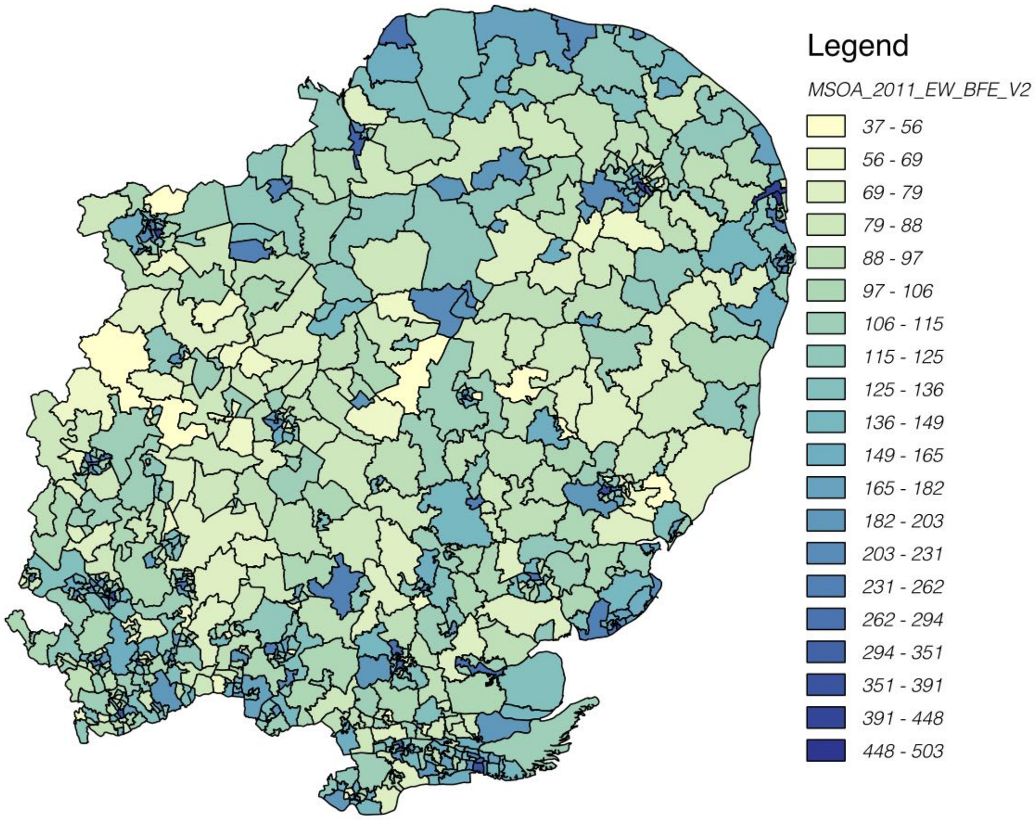


Figure 5-3: Ambulance utilisation (calls) per 1000 of the population shown by MSOA

Analysis was undertaken of all the output areas and after exploration of values any with a population shift greater than 500 from baseline was excluded from the revised dataset.

This process removed 497 output areas and 81,265 emergency calls from the study (See Figure 5-4).

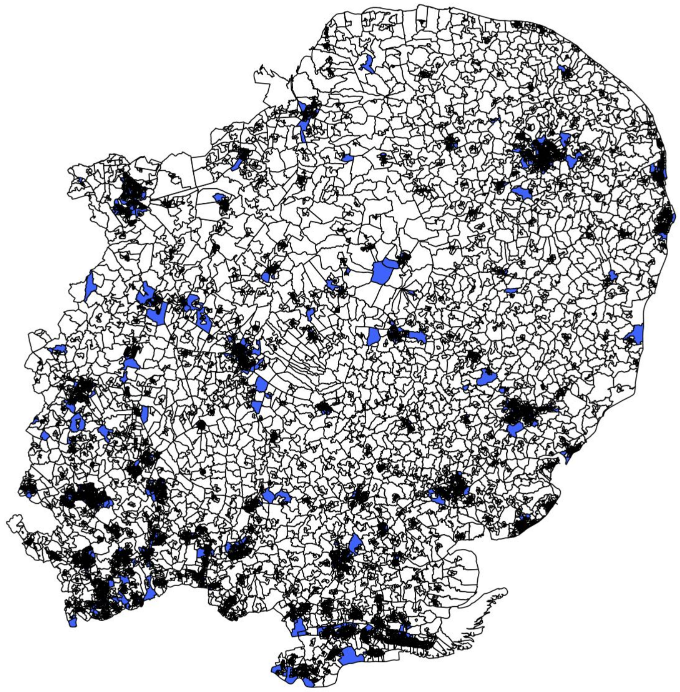


Figure 5-4: Output Areas removed from the study due to workday population shift of over 500 people

5.2.3 Utilisation by Output Areas

5.2.3.1 Output Area

The OA is the smallest geographical area available, with 18,995 areas within the EoE. There were 1,105 areas where no emergency calls were received during the study year. The minimum number of calls received was 1.59 per 1000 of the population and the maximum 3771.28 demonstrating the wide variation in usage. The distribution was plotted as a histogram (Figure 5-5) and a Q-Q plot (Figure 5-6). The data was not normally distributed with highest skew seen in the low acuity level (See Table 5.1).

Medium acuity calls accounted for the highest proportion of total call volume followed by high, and then low. Those areas with no calls were randomly spread across the geography. The visualisation clearly shows variation within the output

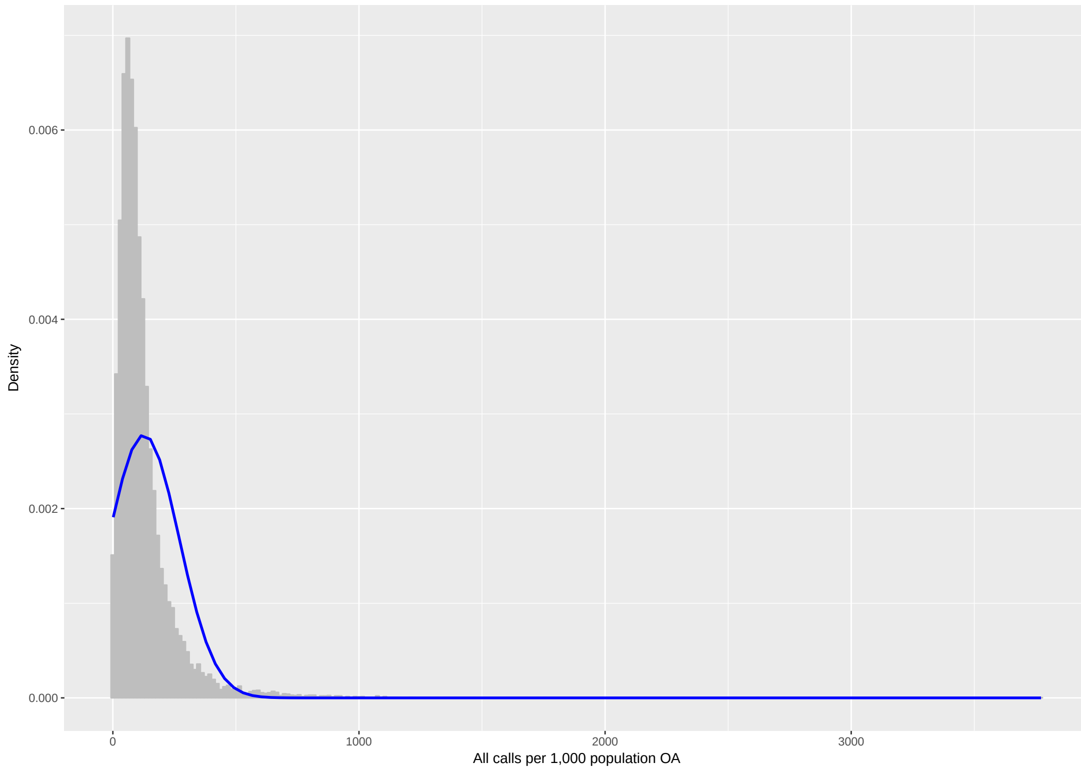


Figure 5-5: Histogram of ambulance utilisation (calls) per 1000 population by OA

Table 5.1: Descriptive Statistics of all ambulance calls per 1000 of the population at OA level

Statistic	All calls	High acuity calls	Medium acuity calls	Low acuity calls
Mean	126.00	39.71	50.32	31.71
Standard Deviation	143.57	45.40	60.51	41.55
Median	90.38	29.03	34.88	21.21
Trimmed	101.76	32.44	39.90	24.84
Mad	65.63	22.77	27.88	19.15
Min	1.59	0.00	0.00	0.00
Max	3771.28	1207.89	1659.57	2085.23
Range	3769.68	1207.89	1659.57	2085.23
Skew	6.35	6.69	6.27	11.05
Kurtosis	82.79	94.89	82.88	378.88
Standard Error	1.07	0.34	0.45	0.31

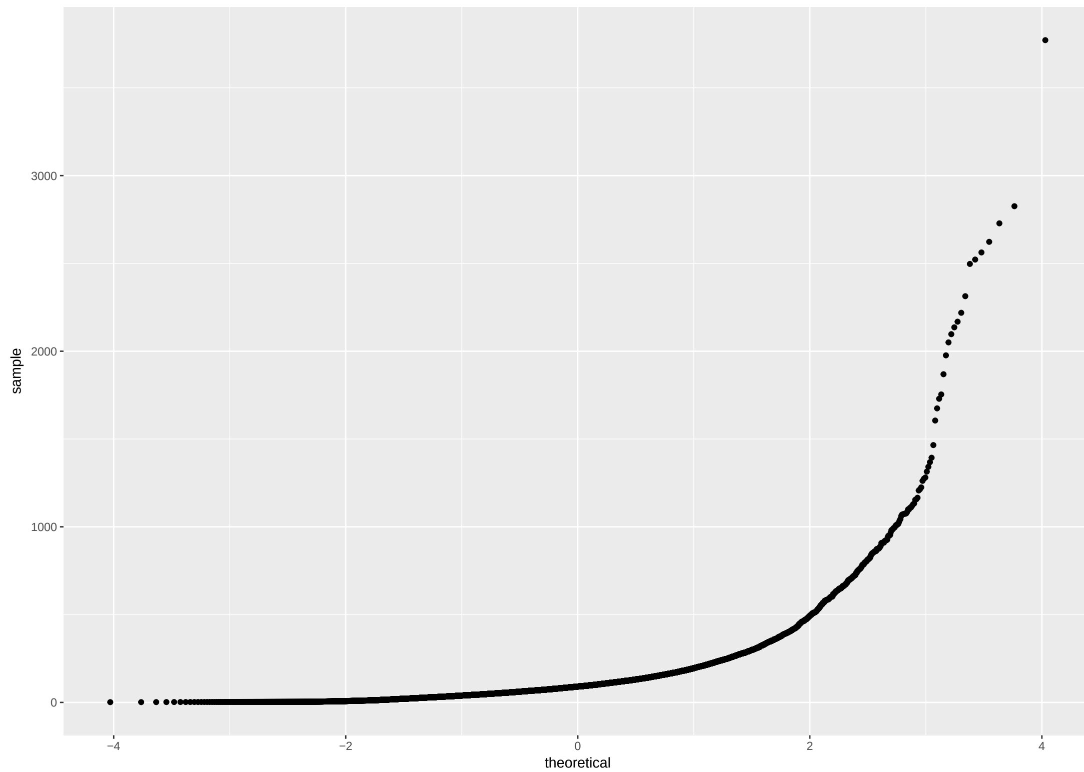


Figure 5-6: Q-Q plot of ambulance utilisation (calls) per 1000 population by OA

areas across the study area (See Figure 5-7).

5.2.3.2 Lower Super Output Area

LSOAs are an aggregation of Output Areas with the 18,995 forming 3,614 LSOA areas. The population of an LSOA is from 1,000 to 4,000 individuals. Utilisation varies from 0.814 to 901 per 1,000 of the population (See Table 5.2). All datasets within the study are available at the LSOA level, and this was ultimately used as the study level.

As with OA, the data was not normally distributed in any acuity groups. As parametric analysis is required in moderated regression analysis a Johnson Transformation was successfully undertaken to produce a normal distribution (See Figures 5-8,5-9,5-10,5-11).

As with OA visualisation shows variation across the region with a pattern of

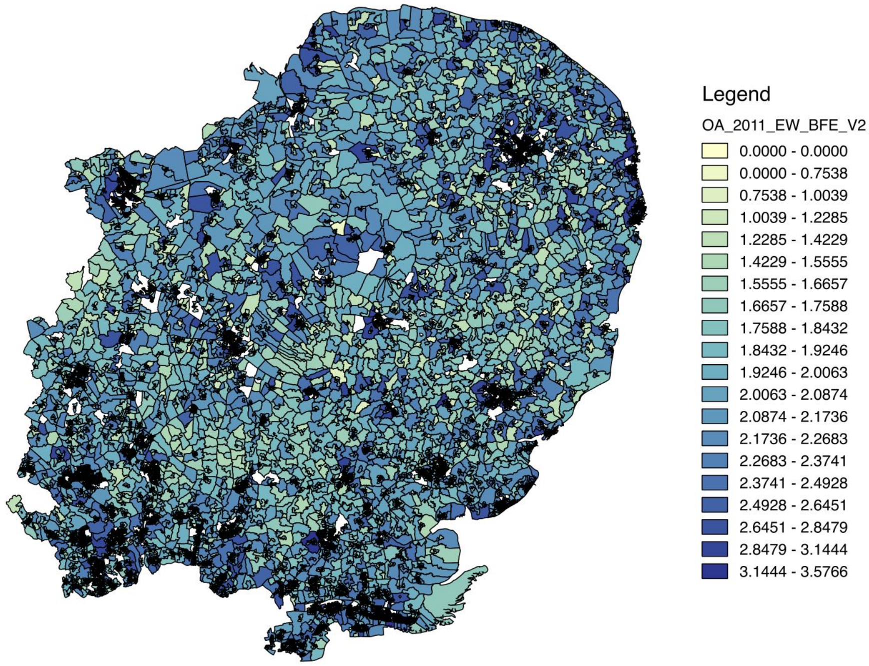
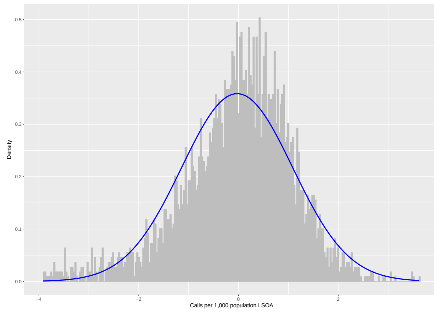


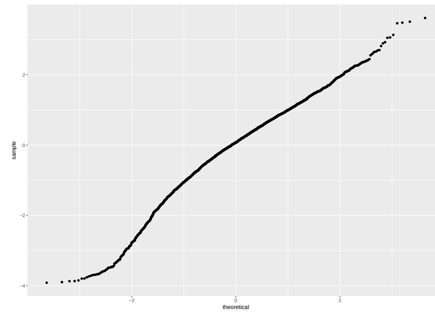
Figure 5-7: Ambulance utilisation (calls) per 1000 population by Output Area

Table 5.2: Descriptive statistics of ambulance utilisation at LSOA level

Statistic	LSOA	Mean	St. Dev.	Min	Max
Population	3,614	1,617.865	326.336	983	5,254
Total Calls	3,610	114.317	70.626	0.814	901.021
High Acuity Calls	3,610	36.373	22.447	0.000	273.413
Medium Acuity Calls	3,610	45.579	29.825	0.000	389.703
Low Acuity Calls	3,610	28.551	18.841	0.000	233.025

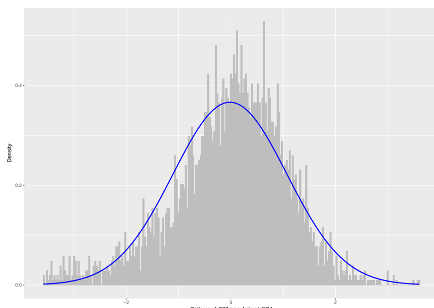


(a) Histogram of transformed ambulance utilisation per 1000 of the population at LSOA level

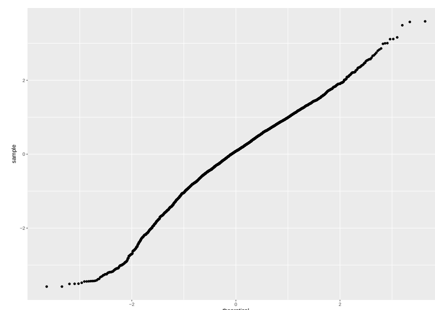


(b) Q-Q plot of transformed ambulance utilisation per 1000 of the population

Figure 5-8: Distribution of ambulance utilisation at LSOA level

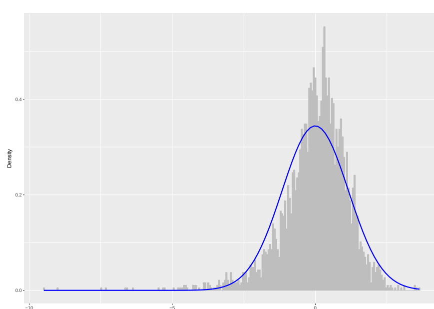


(a) Histogram of transformed high acuity utilisation per 1000 of the population at LSOA level

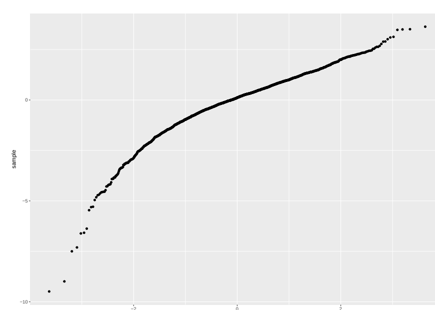


(b) Q-Q plot of high acuity utilisation per 1000 of the population

Figure 5-9: Distribution of high acuity ambulance utilisation at LSOA level

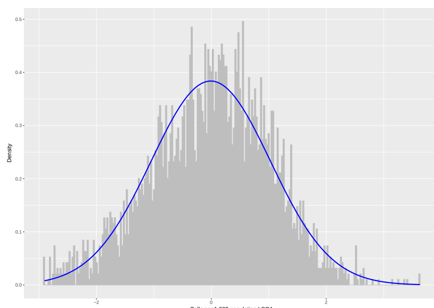


(a) Histogram of transformed medium acuity utilisation per 1000 of the population at LSOA level

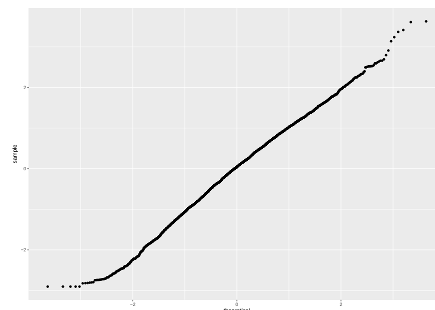


(b) Q-Q plot of transformed medium acuity utilisation per 1000 of the population

Figure 5-10: Distribution of medium acuity ambulance utilisation at LSOA level



(a) Histogram of transformed low acuity utilisation per 1000 of the population at LSOA level



(b) Q-Q plot of transformed low acuity utilisation per 1000 of the population

Figure 5-11: Distribution of low acuity ambulance utilisation at LSOA level higher call volume in urban areas (See Figure 5-12)

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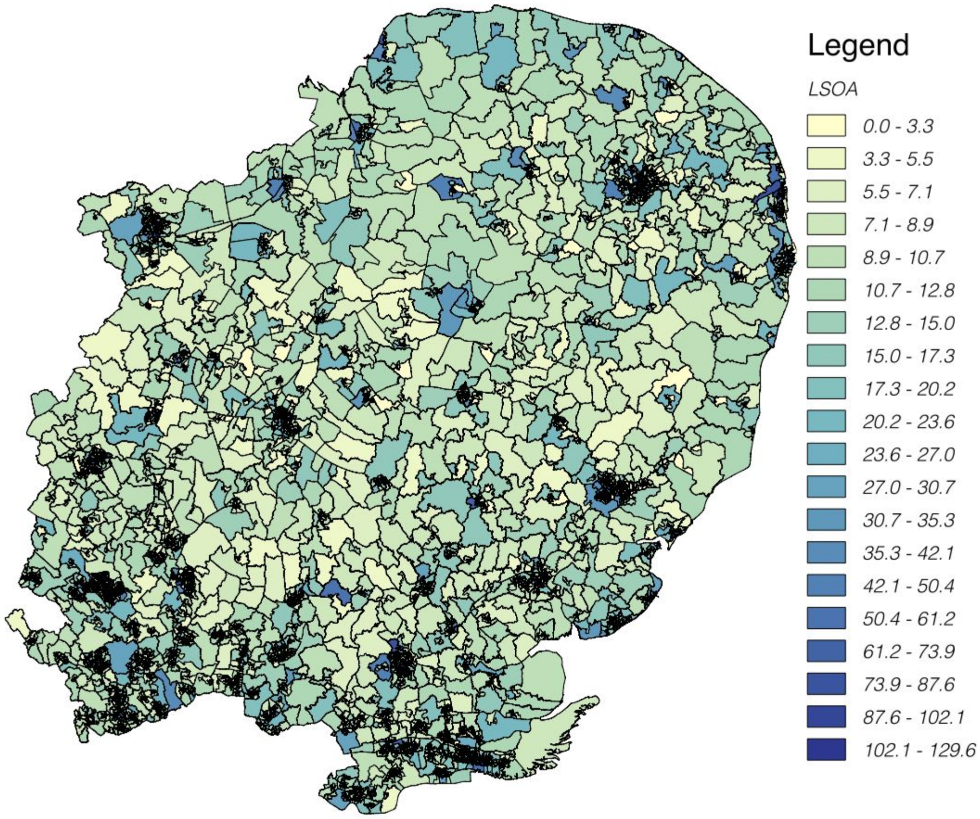

Figure 5-12: Ambulance utilisation per 1000 population by LSOA

5.2.3.3 Medium Super Output Area

MSOAs are a further aggregation creating 736 areas. The population ranges from 5,021 to 15,017 individuals. Utilisation varies from 37.274 to 503.224 per 1,000 of the population (See Table 5.3, & Figure 5-13).

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Table 5.3: Descriptive statistics of ambulance Utilisation per 1000 of population by MSOA

Statistic	Mean	St. Dev.	Min	Max
Population	7,944.246	1,682.386	5,021	15,017
Total calls	1,018.734	559.797	297	4,545
Calls per 1000 population	126.672	57.640	37.274	503.224

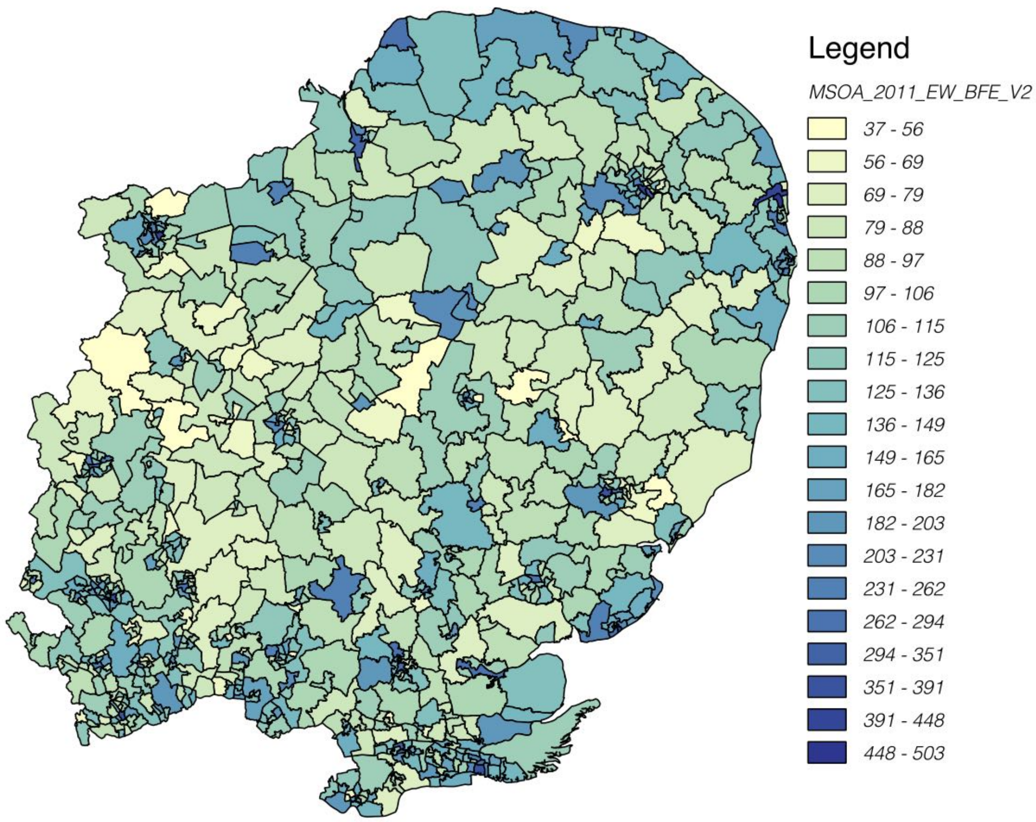

Figure 5-13: Calls per 1000 population by MSOA

5.2.4 Acuity of calls

Key to the uniqueness of this study is the analysis of not just total call volume (including non-conveyed patients) but also utilisation by three acuity levels. A count was undertaken of the AMPDS field and linked to the associated acuity category. Ω & A calls were combined to form a low acuity group, B & C were combined to form a medium acuity group and D & E were combined to form a high acuity group (See Figure 5-14).

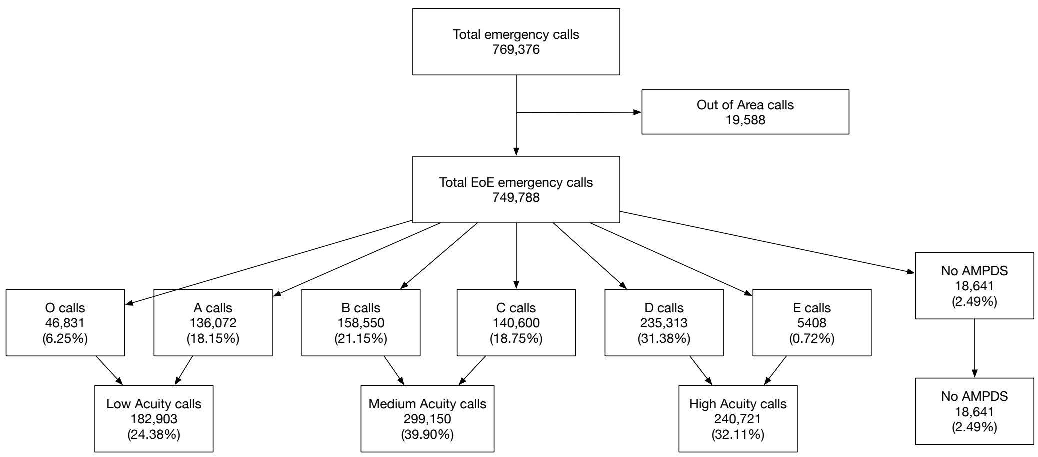

Figure 5-14: Distribution of ambulance utilisation (calls) by acuity category (overall, high, medium, low)

2.49% (18,641) of calls did not have an AMPDS code allocated.

The category split of calls did not change substantially (less than 1%) once the workday population areas were excluded (See Figure 5-15).

5.2.5 Ambulance data summary

There is clearly crude variation in the usage of the ambulance service between geographical areas. The data was adjusted to minimise the effect of workday population shift and standardised with population levels. The utilisation was

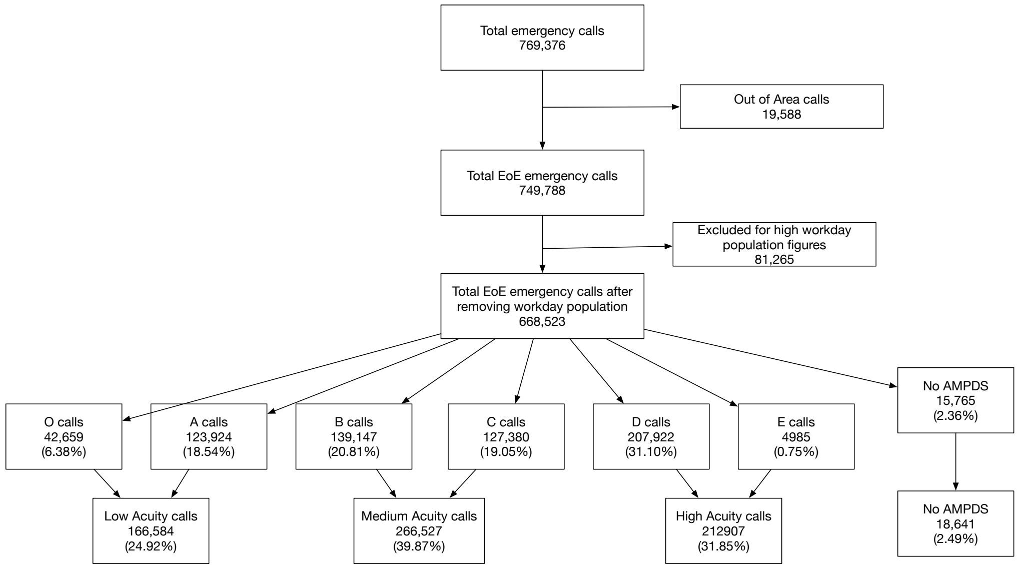

Figure 5-15: Distribution of ambulance utilisation (calls) by acuity category following exclusion of workday population areas

not normally distributed, but this was corrected using a transformation. Analysis at LSOA was selected for the rest of the study as all datasets are available at this geographic level and it maintains a lower level of ecological correlation than MSOA.

The factors identified in the literature review are now explored using descriptives, correlation and graphical modelling to consider patterns related to utilisation at LSOA level.

5.3 Socio-demographics

This section will explore part of the question 'To what extent do socio-demographic factors account for variation in ambulance utilisation'. It will consider this through results from Pearson's correlation, and exploration of census data using GIS and descriptive statistics.

5.3.1 Gender

Within the census the proportion of males and females is recorded for each output area. The literature was unclear of the relationship between ambulance utilisation and gender (Kawakami et al. 2007, Adamson et al. 2003) although females are known to account for greater primary care use (Turnbull et al. 2008). The minimum proportion of males in an area was 39.619% and maximum 73.825% (See Table 5.4).

Table 5.4: Descriptive statistics of the proportion of each LSOA population by census recorded Gender

Proportion of LSOA popn.	Mean	St. Dev.	Min	Max
Male	49.119	2.005	39.619	73.825
Female	50.881	2.005	26.175	60.381

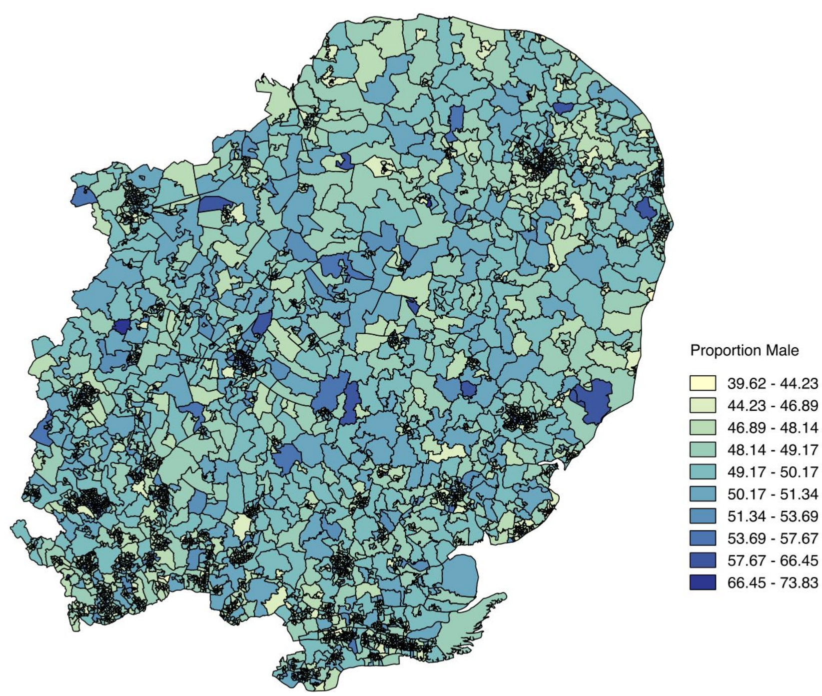

Figure 5-16: Proportion of males recorded in the census for each LSOA

Figure 5-16 shows the distribution of the proportion of each LSOA as male across

Table 5.5: Results of Pearson's correlation of Ambulance Utilisation rate per 1000 of the population by acuity level with LSOA proportion of each Gender category

Proportion of LSOA popn.	Overall Ambulance Utilisation /1000 popn.	High Acuity Ambulance Utilisation /1000 popn.	Medium Acuity Ambulance Utilisation /1000 popn.	Low Acuity Ambulance Utilisation /1000 popn.
Male	-0.130***	-0.104***	-0.113***	-0.172***
Female	0.130***	0.104***	0.113***	0.172***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

the East of England. The distribution of males was relatively even across the region, probably accounted for by the fact that males and females regularly live together, causing an equal mix in geographical areas.

As there are only two options for gender within the census there is an exact correlation between females and males (r=-1, p <0.001)(See Figure 5-17). There is a negative correlation between the proportion of males in an LSOA and ambulance utilisation across all acuity groups, this is a weak but significant correlation. The correlation is strongest (r=-0.172, p <0.01) for utilisation of low acuity (See Table 5.5).

5.3.2 Age

As identified in the literature review, age is the factor across studies consistently reported as causing variation in population use (Zakariassen et al. 2010, Rucker et al. 1997, Svenson 2000). High utilisation groups identified are the elderly and in some studies children under the age of 4. The Department of Health also suggested that the 20-30 age group may be subject to increased ambulance utilisation.

Table 5.6 shows the minimum and maximum number of the proportion of each age category across the LSOAs studied. The minimum values show that most LSOAs have a mix of ages within them, although some areas are lacking the very

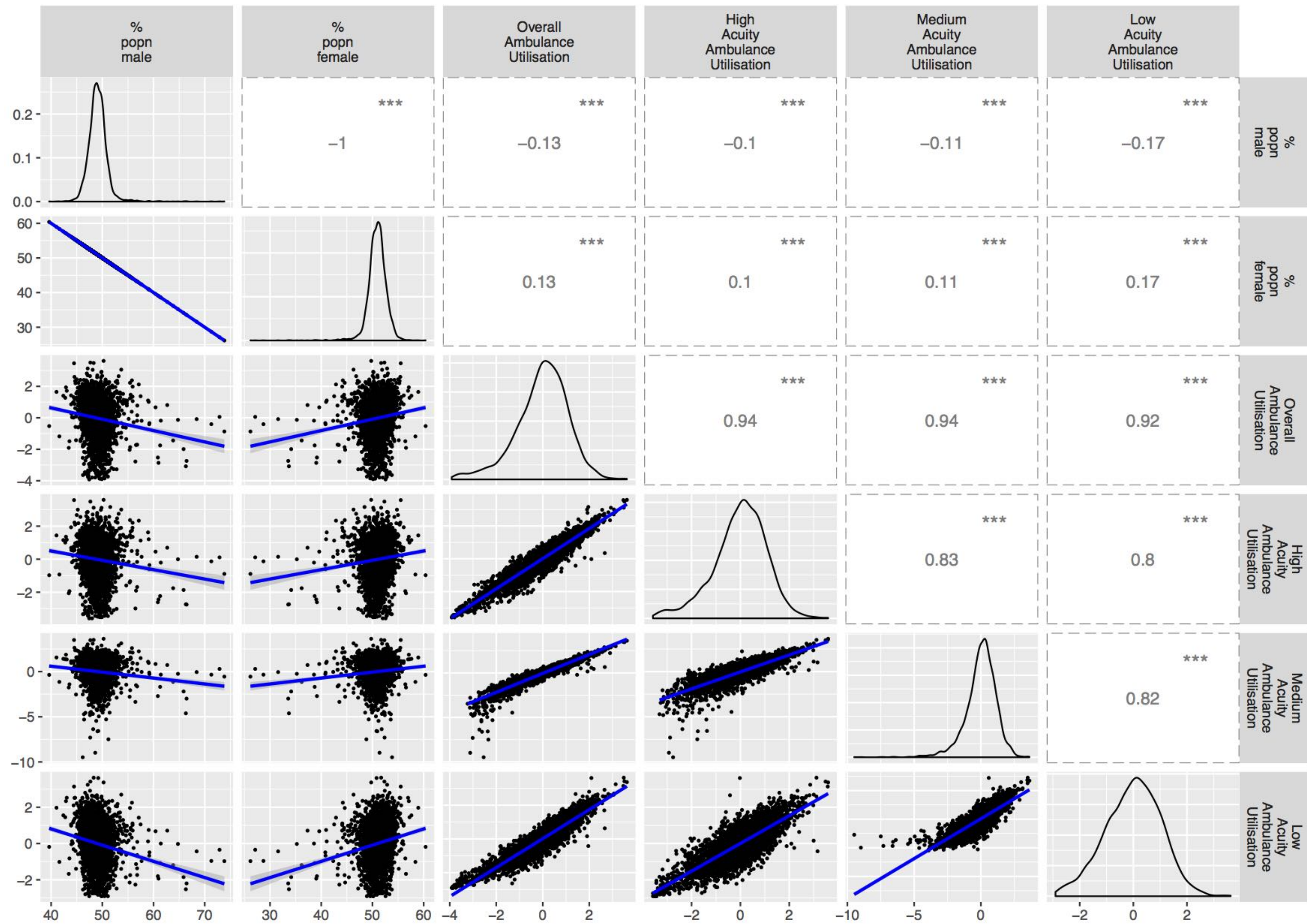

Figure 5-17: Correlation of proportion male and female with utilisation

Table 5.6: Descriptive statistics of the proportion of each LSOA population by census recorded age group

Proportion of LSOA popn.	Mean	St. Dev.	Min	Max
Age 0-4	6.116	2.022	0.768	18.099
Age 5-7	3.422	0.963	0.362	8.172
Age 8-9	2.174	0.627	0.090	5.411
Age 10-14	5.926	1.462	0.492	21.325
Age 15	1.263	0.421	0.000	5.213
Age 16-17	2.546	0.774	0.274	12.942
Age 18-19	2.277	1.459	0.299	41.734
Age 20-24	5.870	3.228	1.932	50.671
Age 25-29	6.086	3.011	1.289	26.371
Age 30-44	20.138	4.369	4.707	40.215
Age 45-59	19.956	3.433	2.699	32.418
Age 60-64	6.460	2.141	0.300	13.836
Age 65-74	9.212	3.663	0.240	31.129
Age 75-84	6.079	2.867	0.245	26.215
Age 85-89	1.625	1.009	0.000	8.559
Age 90 & Over	0.849	0.724	0.000	6.902

elderly, those over age 85.

Age distribution across the region varies with the 0-4 category primarily found in urban areas (See Figure 5-18). The student 18-19 age group is even more pronounced away from rural areas (See Figure 5-19). The over 90 age group is varied, but includes a range of coastal areas (See Figure 5-20).

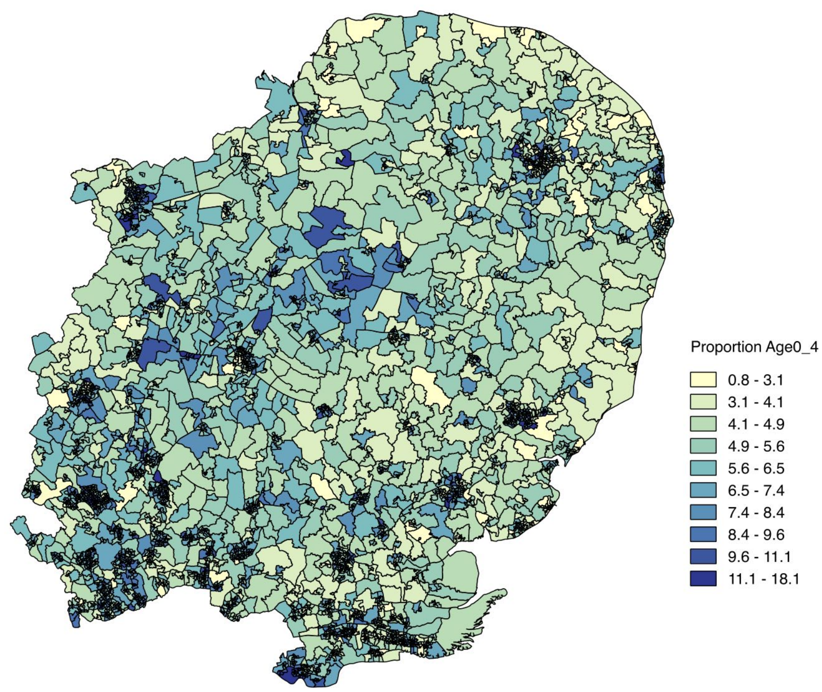

Figure 5-18: Proportion of age group 0-4 recorded in the census for each LSOA

Results from the correlation analysis supported the previous literature, with a positive relationship between all age groups over 65 across all acuity categories. The greatest correlation strength was those over age 90 ($r=0.297$, $p<0.001$). Ages 20-24 ($r=0.056$, $p<0.001$) and ages 25-29 ($r=0.053$, $p<0.01$) were positively correlated with utilisation, although this was a weak relationship. The results show a negative relationship with utilisation for children, unlike the prediction from the literature where you would expect this relationship to be positive (See Table 5.7). Child age groups tend to be correlated with middle age groups as parents and there is correlation between similar age categories i.e. those over age 75 (See

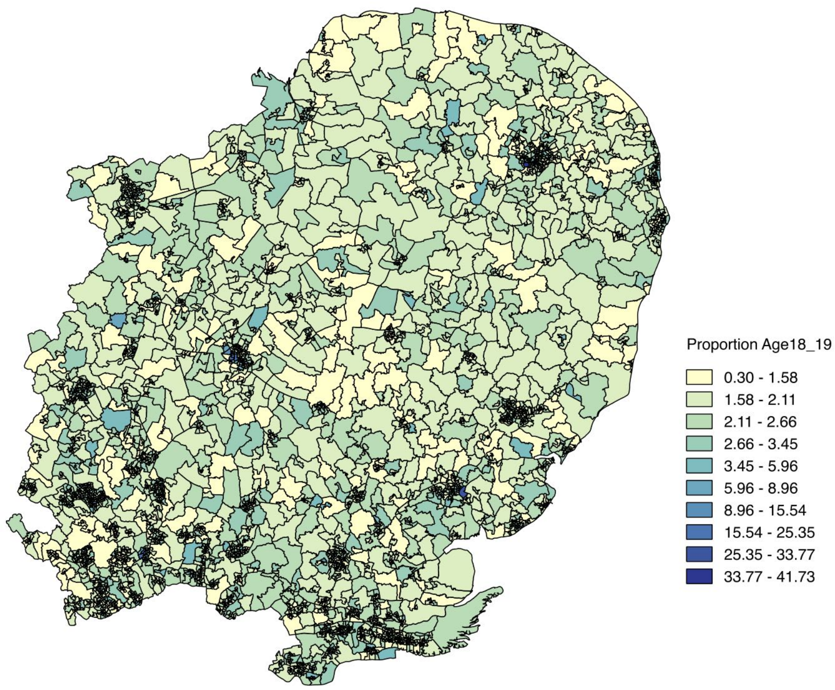

Figure 5-19: Proportion of age group 18-19 recorded in the census for each LSOA

Figure 5-21 & 5-22).

5.3.3 Ethnicity

Ethnicity is less often found as a factor studied in relation to ambulance utilisation (Rucker et al. 1997). Where it has been identified it relates to increased usage from non-whites (Siler 1975, Aldrich et al. 1971, McConnel & Wilson 1999).

The groupings studied show that the maximum white population in an LSOA is 99.807% and minimum 7.692%, this is an urban part of Luton, Bedfordshire (See Table 5.8).

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Distribution of ethnic groups is evident by geography. Asian ethnicity is pronounced in town and city locations with very few in rural and coastal areas (See

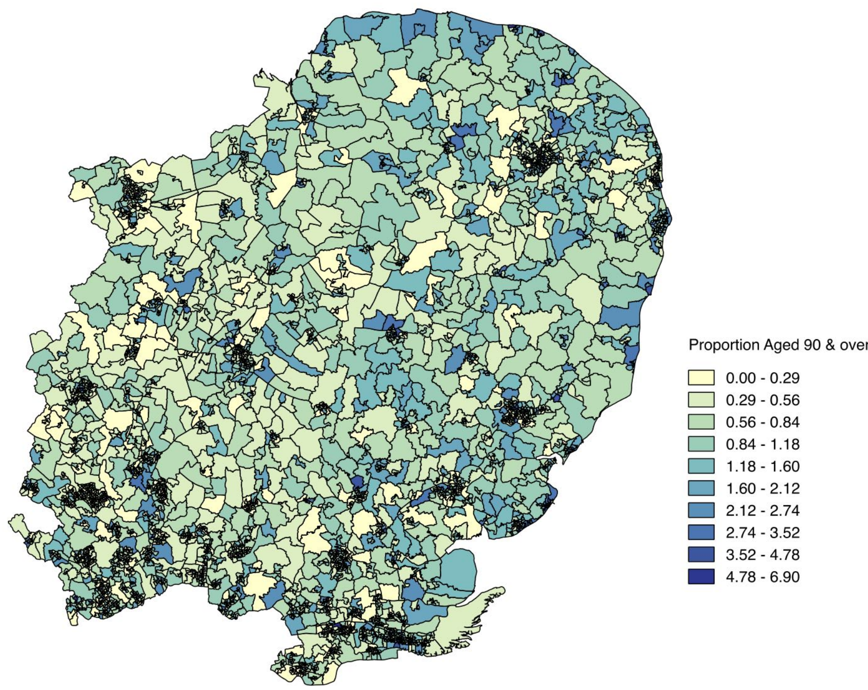

Figure 5-20: Proportion of age group 90 and over recorded in the census for each LSOA

Table 5.7: Results of Pearson's correlation of Ambulance Utilisation rate per 1000 of the population by acuity level with LSOA proportion of each Age category

Proportion of LSOA popn.	Overall Ambulance Utilisation /1000 popn.	High Acuity Ambulance Utilisation /1000 popn.	Medium Acuity Ambulance Utilisation /1000 popn.	Low Acuity Ambulance Utilisation /1000 popn.
Age 0-4	-0.055***	0.011	-0.051**	-0.082***
Age 5-7	-0.127***	-0.057***	-0.136***	-0.152***
Age 8-9	-0.162***	-0.099***	-0.165***	-0.176***
Age 10-14	-0.163***	-0.112***	-0.172***	-0.174***
Age 15	-0.086***	-0.052**	-0.096***	-0.100***
Age 16-17	-0.091***	-0.064***	-0.102***	-0.092***
Age 18-19	-0.025	-0.012	-0.024	-0.036*
Age 20-24	0.056***	0.069***	0.064***	0.030
Age 25-29	0.053**	0.082***	0.074***	0.013
Age 30-44	-0.130***	-0.071***	-0.119***	-0.164***
Age 45-59	-0.167***	-0.172***	-0.181***	-0.163***
Age 60-64	-0.005	-0.063***	-0.011	0.029
Age 65-74	0.099***	0.028	0.095***	0.141***
Age 75-84	0.228***	0.149***	0.213***	0.283***
Age 85-89	0.295***	0.213***	0.289***	0.347***
Age 90 & Over	0.297***	0.227***	0.302***	0.334***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5.8: Descriptive statistics of the proportion of each LSOA population by census recorded Ethnicity

Proportion of LSOA popn.	Mean	St. Dev.	Min	Max
White ethnicity	91.164	10.785	7.692	99.807
Mixed ethnicity	1.894	1.226	0.000	9.804
Asian ethnicity	4.521	7.979	0.000	85.734
Black ethnicity	1.946	2.852	0.000	22.914
Other ethnicity	0.474	0.637	0.000	11.998

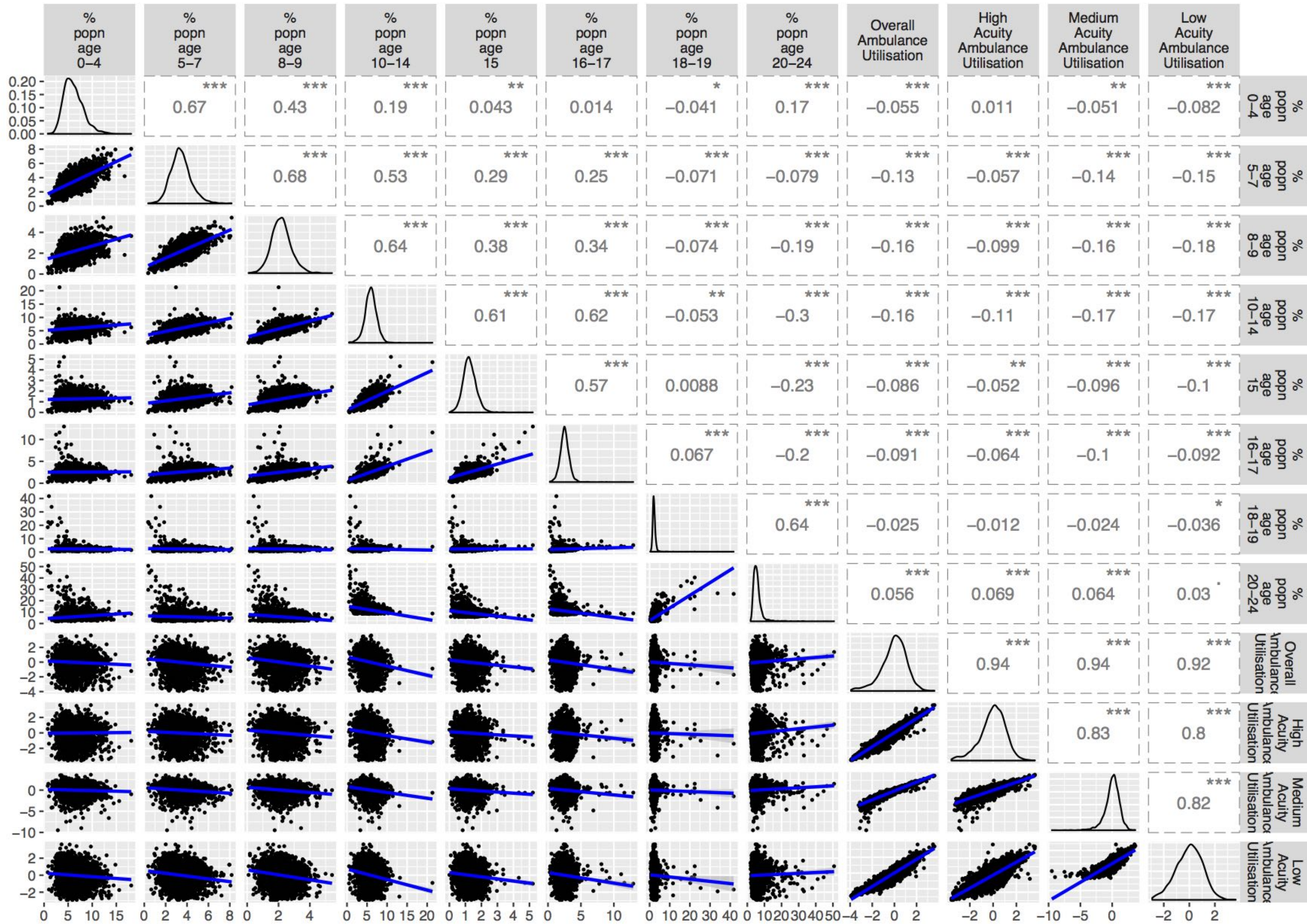

Figure 5-21: Correlation of age groups 0-24 with utilisation

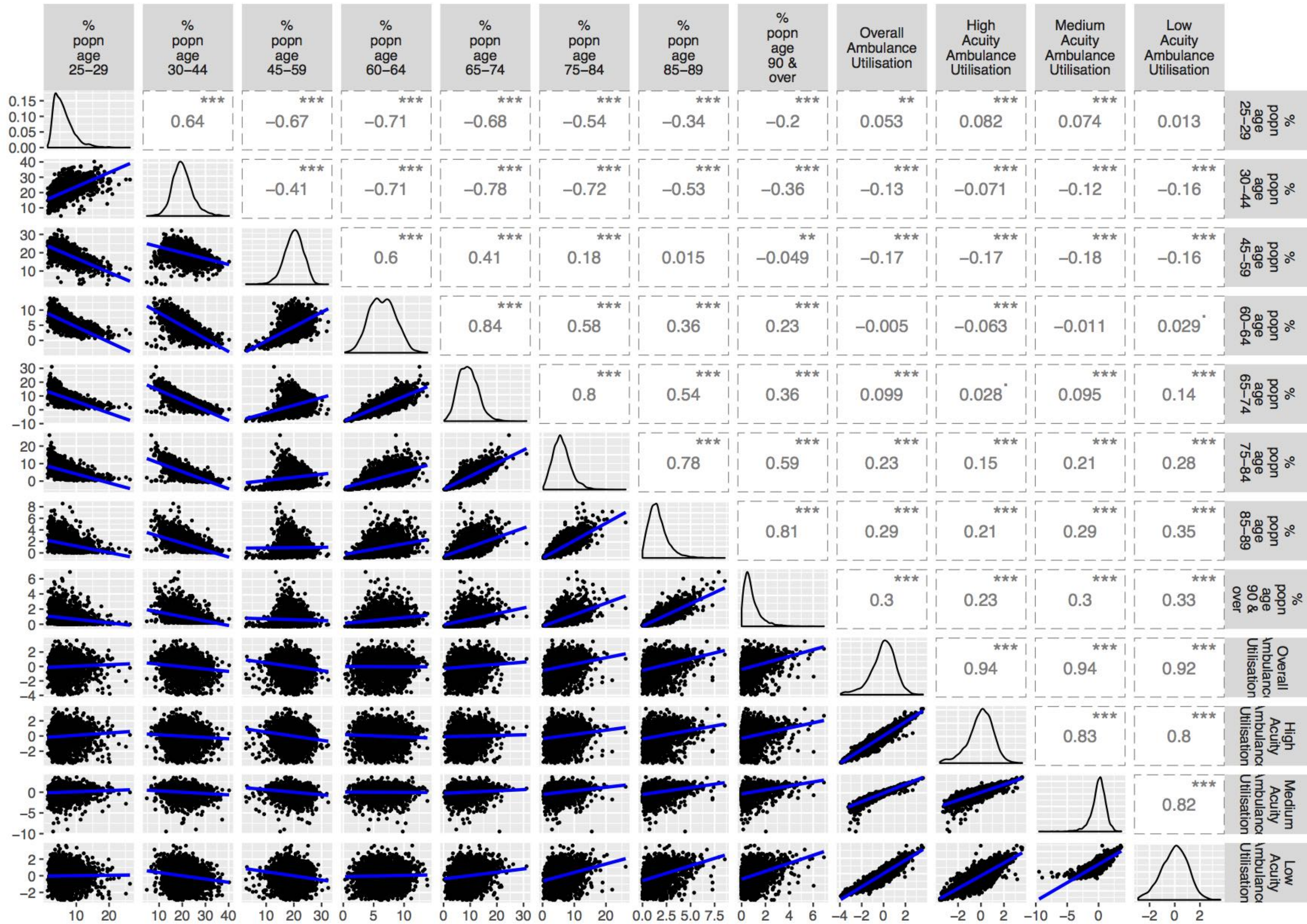

Figure 5-22: Correlation of age groups 25 and over with utilisation

Figure 5-23).

Mixed and black ethnicity are similarly focused in these areas (See Figure 5-25 & 5-24).

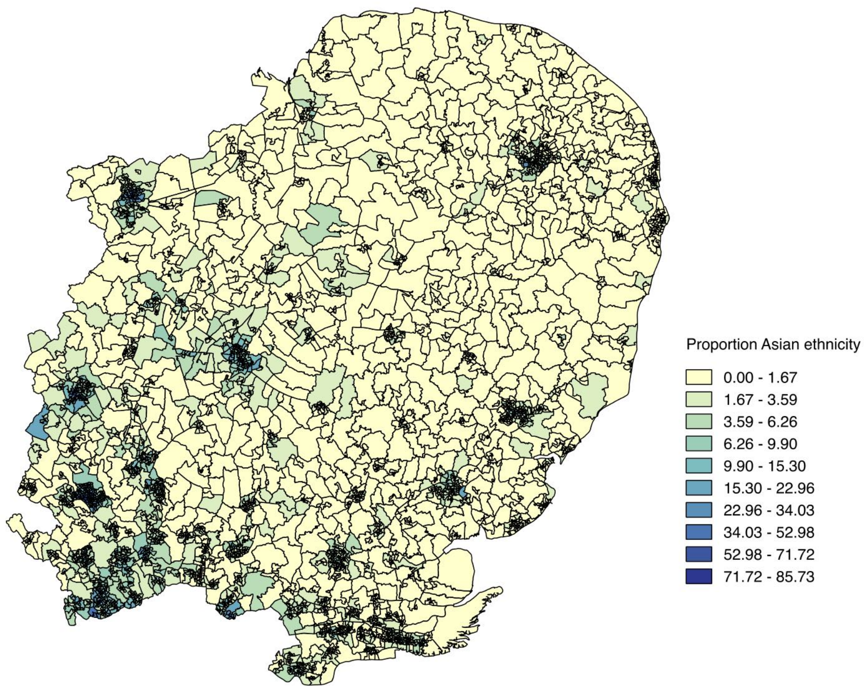

Figure 5-23: Proportion of asian ethnicity recorded in the census for each LSOA

Across overall, high and medium acuity ambulance utilisation there are significant correlations with the proportion of the population from varying ethnic backgrounds. Table 5.9 shows that the proportion of the population with white ethnicity is negatively associated with ambulance utilisation rate (r=-0.109, p<0.001). Within the high acuity group Mixed (r=0.156, p<0.001), Asian (r=0.152, p<0.001), Black (r=0.202, p<0.001) and other (r=0.073, p<0.001) ethnicity were correlated positively with utilisation, the strongest relationship being with the proportion of the population as black ethnicity. Ethnicity is less significant as a factor in the low acuity calls with mixed, asian and other showing non significant results and black and white with very weak relationships (See Table5.9, Figure 5-26).

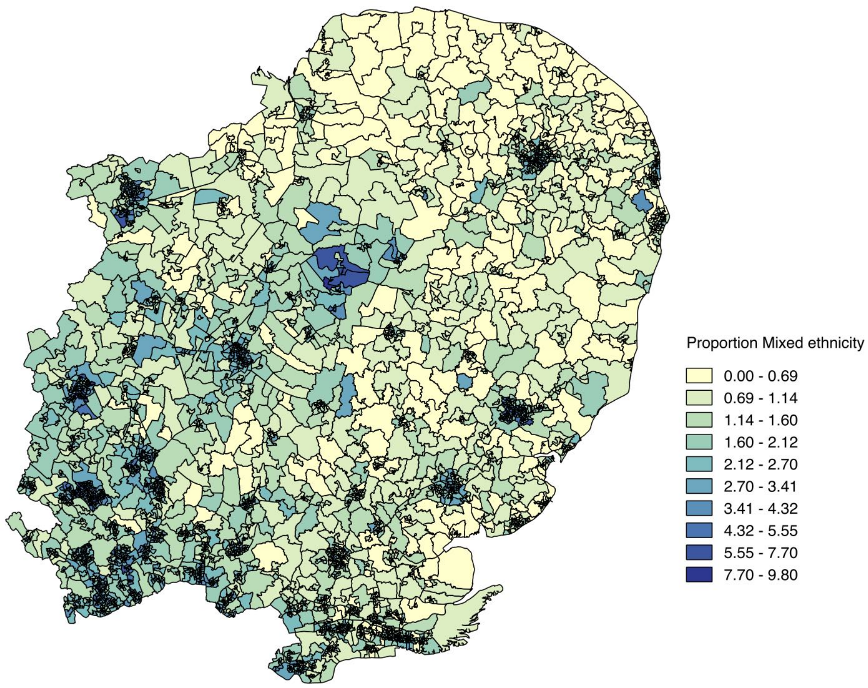

Figure 5-24: Proportion of mixed ethnicity recorded in the census for each LSOA

Table 5.9: Results of Pearson's correlation of Ambulance Utilisation rate per 1000 of the population by acuity level with LSOA proportion of each Ethnicity category

Proportion of LSOA popn.	Overall Ambulance Utilisation /1000 popn.	High Acuity Ambulance Utilisation /1000 popn.	Medium Acuity Ambulance Utilisation /1000 popn.	Low Acuity Ambulance Utilisation /1000 popn.
White ethnicity	-0.109***	-0.188***	-0.072***	-0.042*
Mixed ethnicity	0.085***	0.156***	0.061***	0.015
Asian ethnicity	0.086***	0.152***	0.053**	0.030
Black ethnicity	0.126***	0.202***	0.090***	0.067***
Other ethnicity	0.034*	0.073***	0.032	-0.001

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

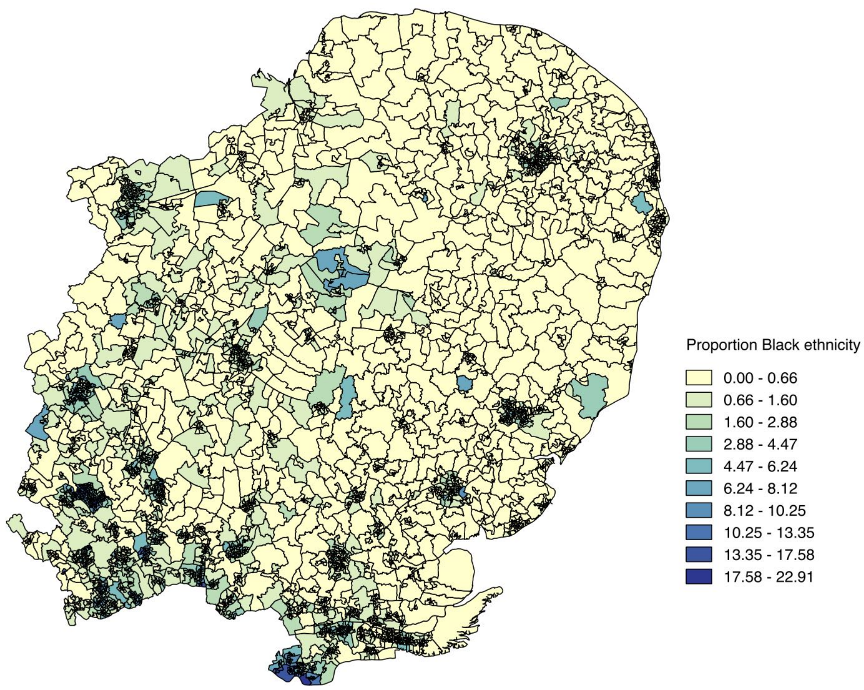

Figure 5-25: Proportion of black ethnicity recorded in the census for each LSOA

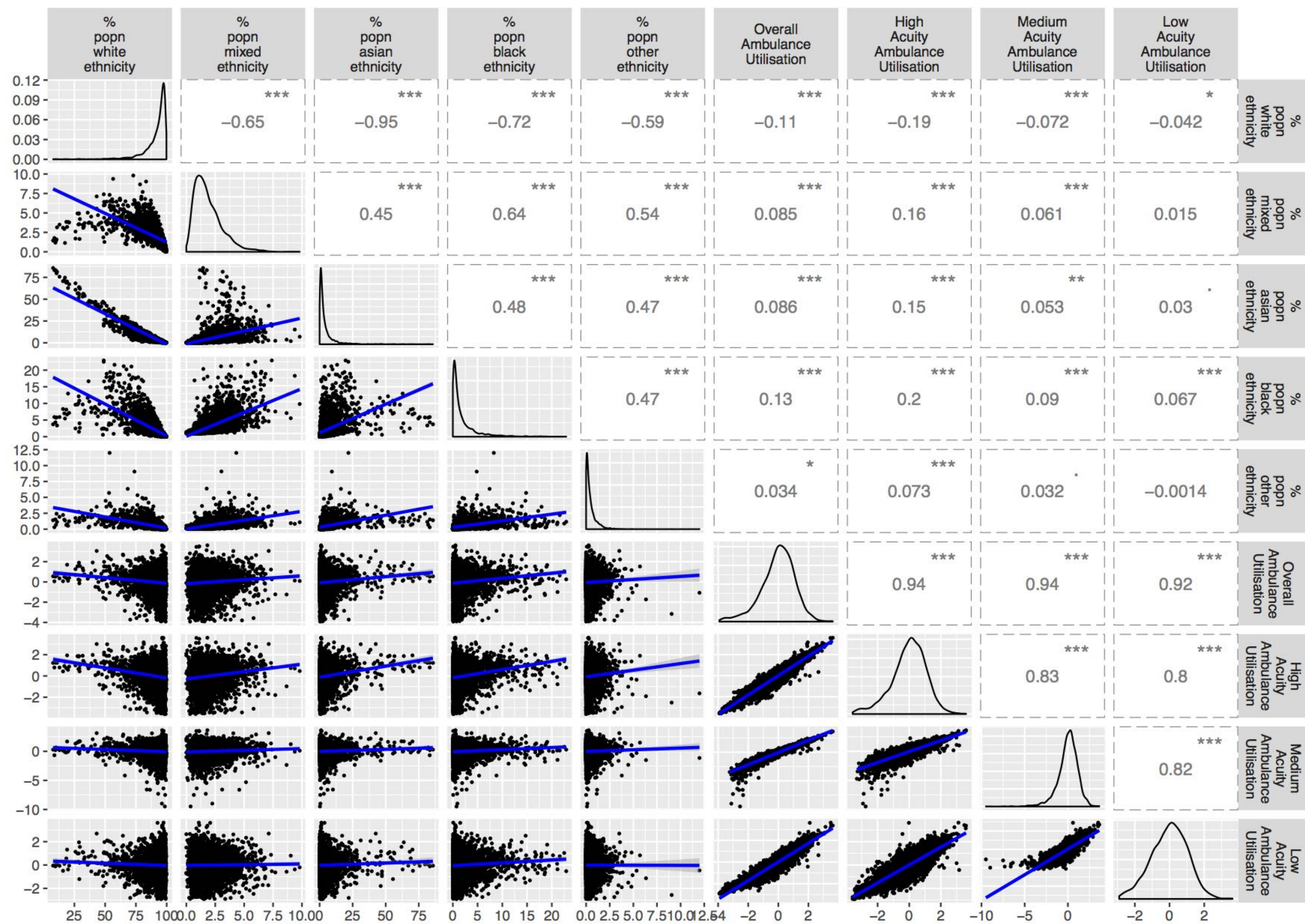

Figure 5-26: Correlation of ethnic groups with utilisation

5.3.4 Country of birth

Country of Birth in relation to ambulance utilisation has not been studied previously. The rationale for including it as a factor alongside ethnicity was the potential impact country of birth may have on your health beliefs and related behaviour. Whilst ethnicity can be varied amongst those born in the UK and therefore potentially sharing UK health beliefs. Three categories were explored, British, European and other. Country of birth specified as other had a wide range, from 0.57% to 57.440% of the population across the LSOAs (See Table 5.10).

Table 5.10: Descriptive statistics of the proportion of each LSOA population by census recorded Country of Birth

Proportion of LSOA popn.	Mean	St. Dev.	Min	Max
UK country of birth	90.125	8.350	39.073	98.746
European country of birth	3.519	3.412	0.148	31.021
Other country of birth	6.356	5.943	0.570	57.440

Distribution for country of birth specified as other is focussed on urban areas and those areas closer to London. Figure 5-27 shows darker blue areas for greatest proportion, these include Peterborough and Watford. The deep blue outlier in the centre of the map contains an American airforce base, accounting for the high population specifying other country of birth.

European country of birth is more dispersed across the region, although still focussed in urban areas primarily (See Figure 5-28).

The results from the correlation analysis show that within overall utilisation there is a negative relationship with UK country of birth (r=-0.092, p<0.001) and a positive relationship for european (r=0.112, p<0.001) and other (r=0.066, p<0.001). For high acuity utilisation the correlations are stronger, showing a stronger relationship between utilisation rate and specified country of birth. For UK country of birth there was a negative relationship (r=-0.139, p<0.001), and for european (r=0.128, p<0.001) and other (r=0.122, p<0.001) these were positive relationships. The strength of the correlations were extremely weak for low

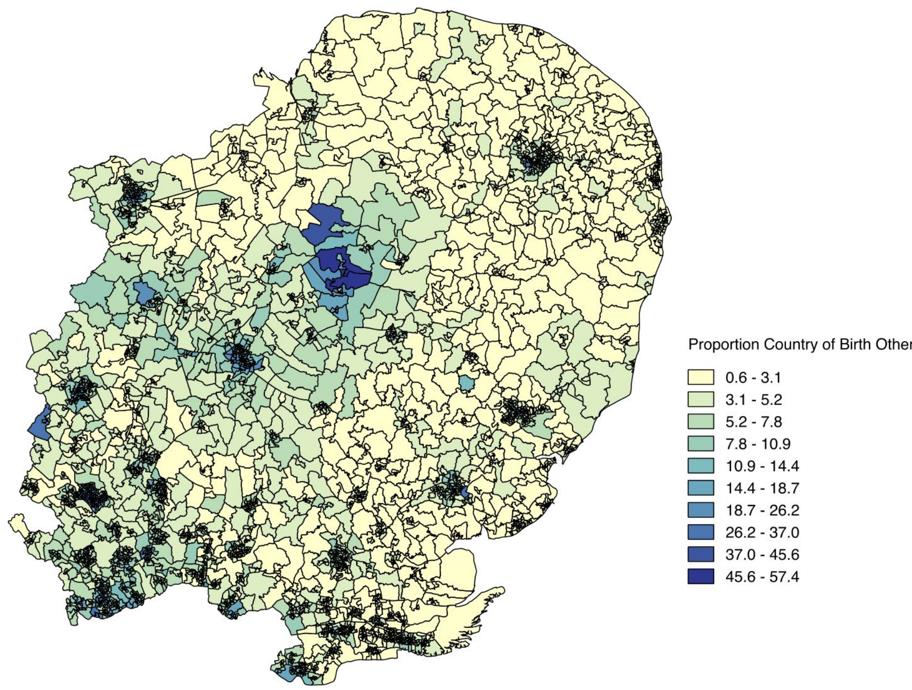

Figure 5-27: Proportion of country of birth recorded in the census for each LSOA

acuity calls (See Table 5.11, Figure 5-29).

5.3.5 Socio-economic status

Socio-economic status (NS-SEC) is a UK constructed measure of employment relations and conditions of occupations. It is not found within the literature specifically in relation to ambulance utilisation rate. However, unemployment is shown to be related to higher ambulance utilisation (Svenson 2000, Siler 1975), as are measures of deprivation which are linked to employment status (Peacock & Peacock 2006, Stephenson 2008).

The NS-SEC was initially assessed using the 8 groups plus students structure.

1. Higher managerial, administrative and professional occupations

2. Lower managerial, administrative and professional occupations

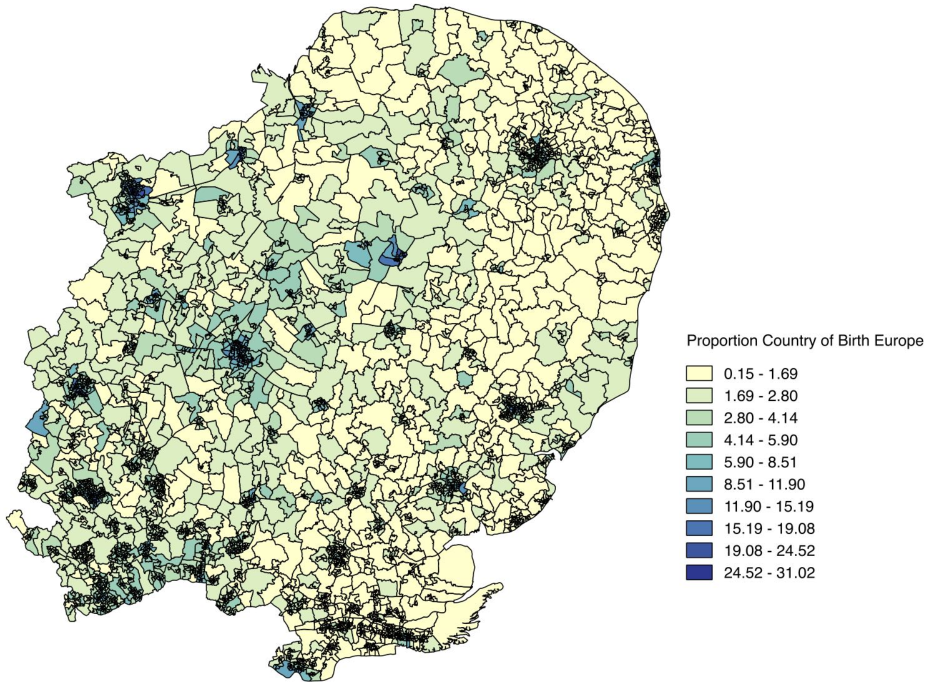

Figure 5-28: Proportion of European country of birth recorded in the census for each LSOA

Table 5.11: Results of Pearson's correlation of Ambulance Utilisation rate per 1000 of the population by acuity level with LSOA proportion of each Country of Birth category

Proportion of LSOA popn.	Overall Ambulance Utilisation /1000 popn.	High Acuity Ambulance Utilisation /1000 popn.	Medium Acuity Ambulance Utilisation /1000 popn.	Low Acuity Ambulance Utilisation /1000 popn.
UK country of birth	-0.092***	-0.139***	-0.074***	-0.033*
European country of birth	0.112***	0.128***	0.109***	0.069***
Other country of birth	0.066***	0.122***	0.042*	0.006

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

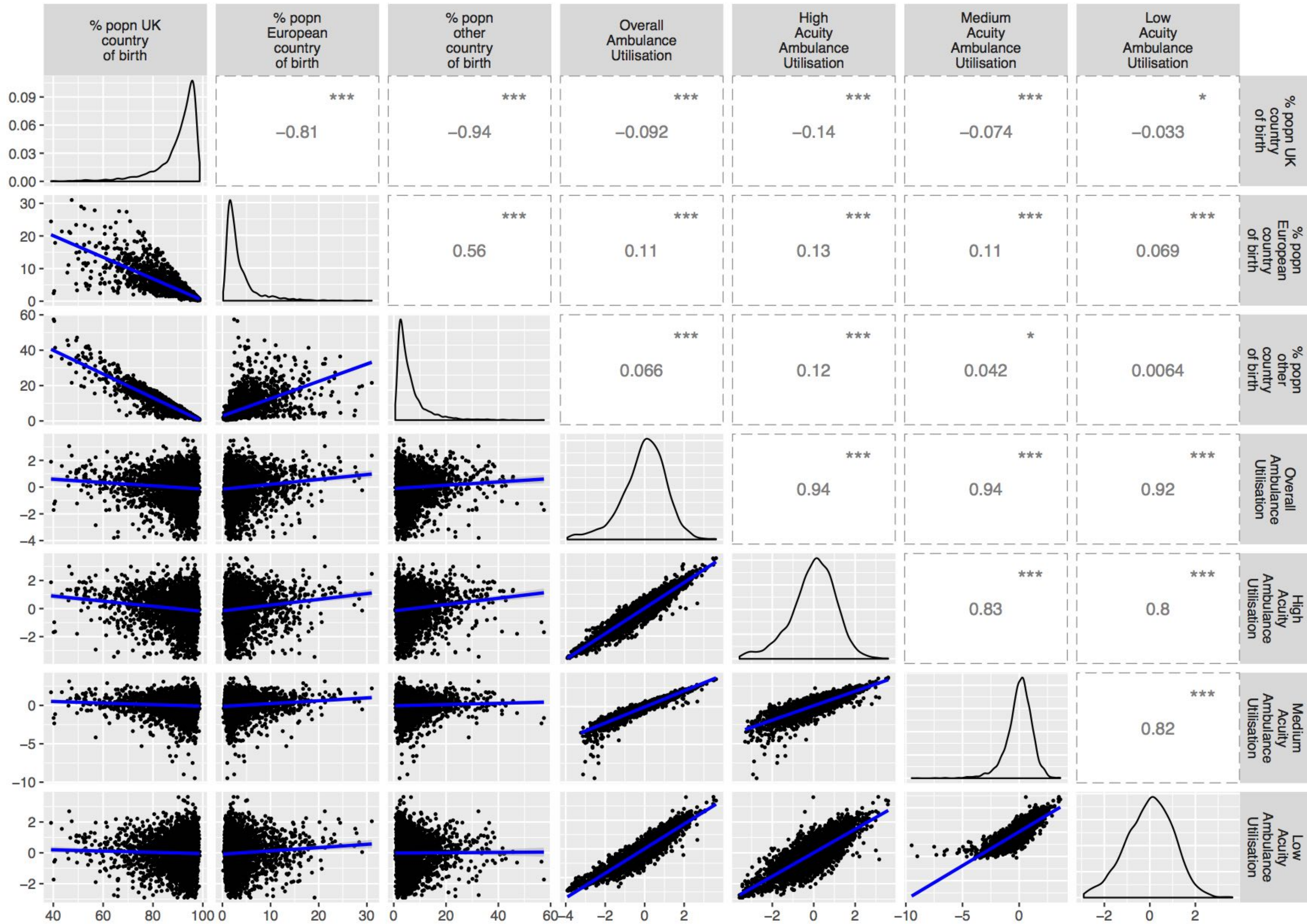

Figure 5-29: Correlation of country of birth with utilisation

3. Intermediate occupations

4. Small employers and own account workers

5. Lower supervisory and technical occupations

6. Semi-routine occupations

7. Routine occupations

8. Never worked and long-term unemployed

Table 5.12 shows the variation in proportion of population across the LSOAs. The range was greatest on SES group 1 from 1.142% to 72.941%. LSOAs are constructed to group similar households together so this is an expected finding.

Table 5.12: Descriptive statistics of the proportion of each LSOA population by census recorded Socio-economic Status group

Proportion of LSOA popn.	Mean	St. Dev.	Min	Max
SES Group 1	10.828	5.652	0.571	36.471
SES Group 2	21.684	5.459	2.574	38.048
SES Group 3	14.042	3.135	0.925	36.218
SES Group 4	10.382	3.116	0.679	23.649
SES Group 5	7.075	2.008	0.502	13.734
SES Group 6	14.272	4.534	0.797	29.347
SES Group 7	10.608	4.682	0.531	27.042
SES Group 8	4.082	2.871	0.548	29.619
SES Students	7.026	5.368	1.814	87.088

Distribution of SES group 1, Higher managerial, administrative and professional occupations is predominantly in the counties closer to London; Bedfordshire, Hertfordshire and Essex (See Figure 5-30). SES group 8 was higher in inner-city locations and some fenland areas which have more manual labour, lower pay and associated deprivation (See Figure 5-31).

Students were clearly increased, as expected in university locations. Shown by darker blue on Figure 5-32.

Table 5.13 shows the results of the correlation analysis between proportion of the

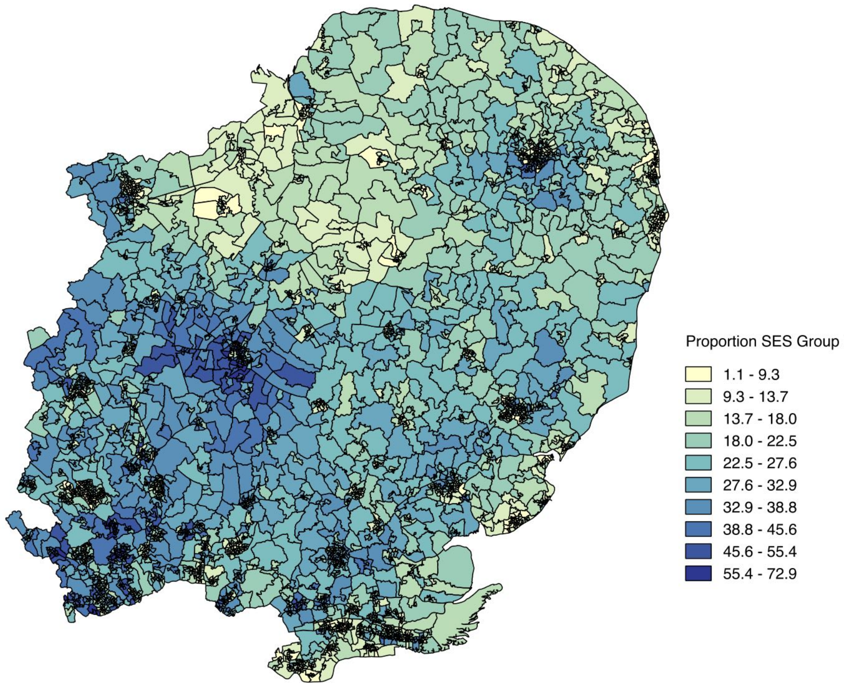

Figure 5-30: Proportion of SES group 1 recorded in the census for each LSOA

population within each SES group and ambulance utilisation. SES groups 1 to 3, less deprived, were negatively related to ambulance utilisation across all acuity groups. SES groups 4 to 8 are positively correlated with ambulance utilisation. Showing that an increase in the proportion is related to an increase in the number of calls. As the groups become less professional the strength of the relationship with ambulance utilisation increases, SES group 5 ($r=0.097$, $p<0.001$) to SES group 8 ($r=0.296$, $p<0.001$).

There are clearly correlations between similar classes allowing aggregated structures to exist (See Figure 5-33).

5.3.6 Socio-demographic summary

Each of the factors has been considered in isolation so far. However, there is known multi-collinearity between some of these factors. For example the pro-

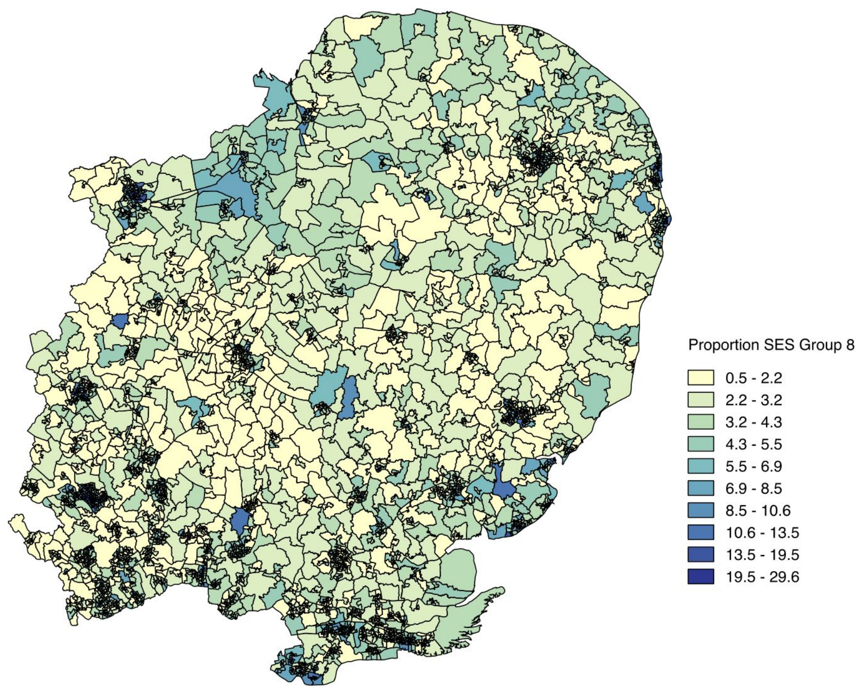

Figure 5-31: Proportion of SES group 8 recorded in the census for each LSOA

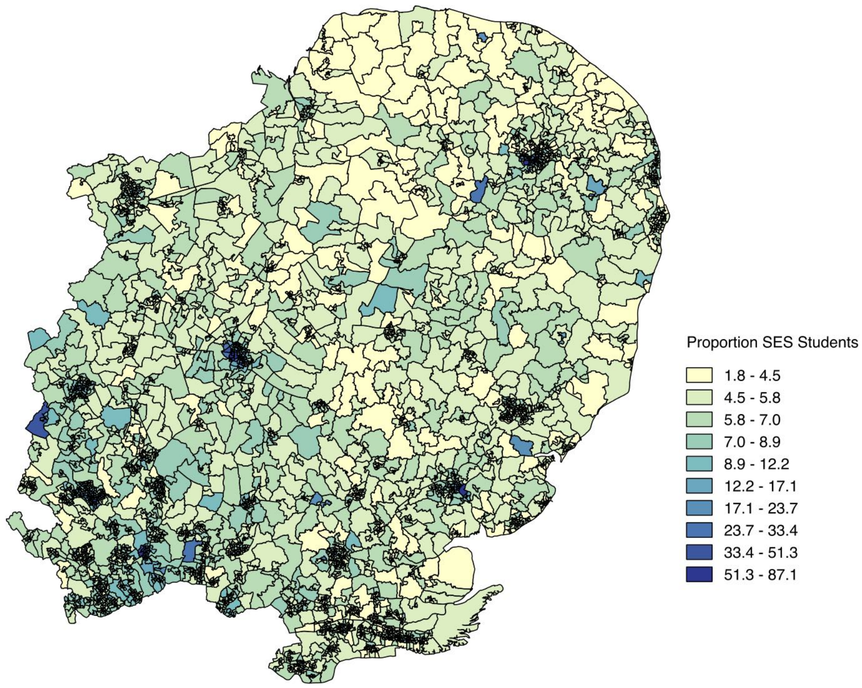

Figure 5-32: Proportion of students recorded in the census for each LSOA

Table 5.13: Results of Pearson's correlation of Ambulance Utilisation rate per 1000 of the population by acuity level with LSOA proportion of each SES group

Proportion of LSOA popn.	Overall Ambulance Utilisation /1000 popn.	High Acuity Ambulance Utilisation /1000 popn.	Medium Acuity Ambulance Utilisation /1000 popn.	Low Acuity Ambulance Utilisation /1000 popn.
SES Group 1	-0.233***	-0.239***	-0.236***	-0.234***
SES Group 2	-0.261***	-0.268***	-0.260***	-0.243***
SES Group 3	-0.187***	-0.180***	-0.196***	-0.128***
SES Group 4	0.057***	0.023	0.049**	0.049**
SES Group 5	0.097***	0.094***	0.115***	0.105***
SES Group 6	0.204***	0.187***	0.224***	0.221***
SES Group 7	0.235***	0.242***	0.241***	0.219***
SES Group 8	0.296***	0.335***	0.279***	0.250***
SES Students	0.016	0.034*	0.008	-0.010

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

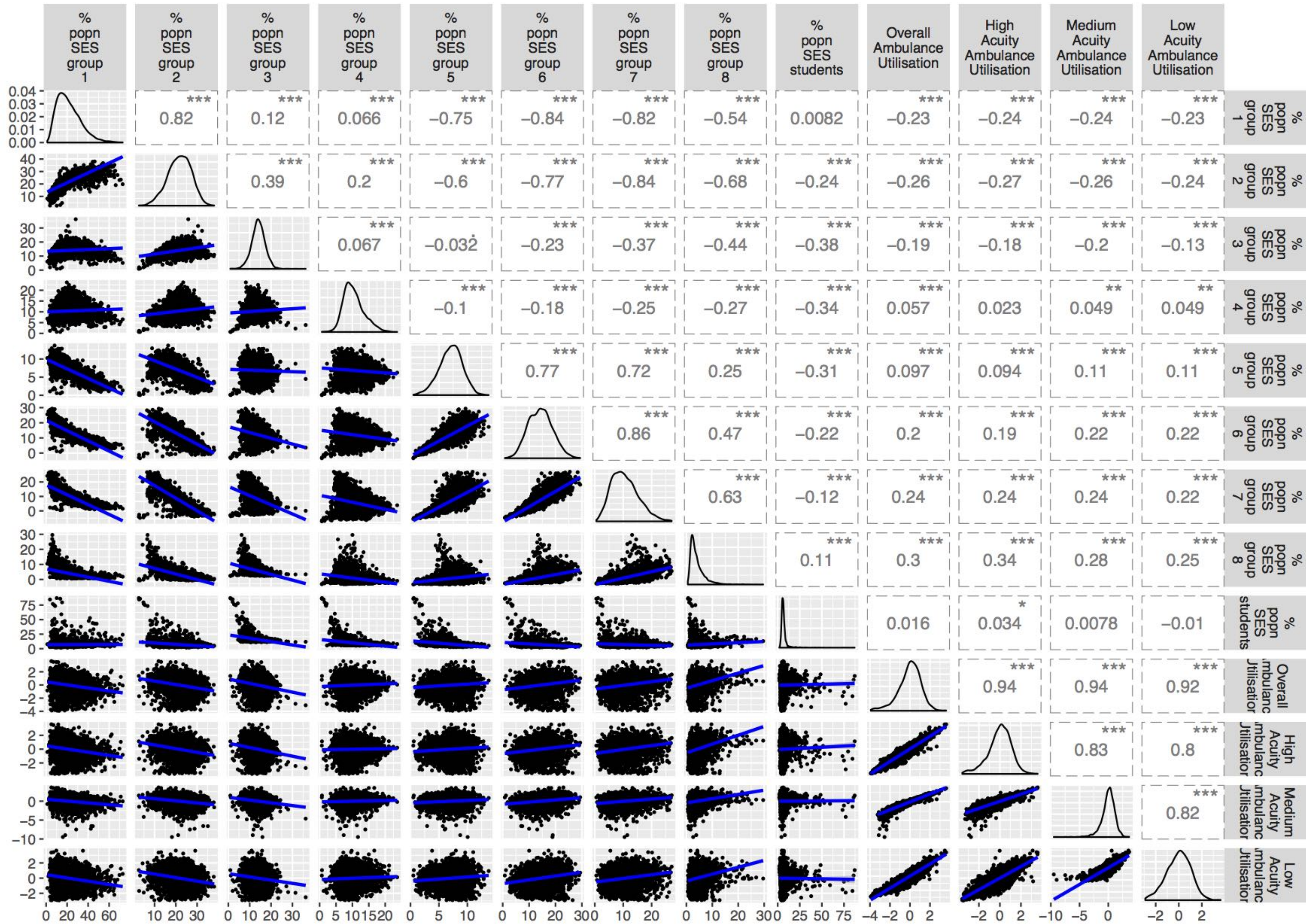

Figure 5-33: Correlation of SES group with utilisation

portion of those with a socio-economic status of students will be correlated with those who are age 18-24, as they are more likely to be students. A correlation matrix of the variables was constructed see Figure 5-34 which shows positive correlations between variables in blue and negative correlations in red. The strength of the relationship is denoted by the depth of the colour.

Notable significant positive correlation occurs between the following variables as expected:

- Male and female, as this is a binary variable.
- Age 0-4 and age 30-44, related to the typical age to become a parent.
- Age 18-19 and student socio-economic status, related to the typical age for university study.
- Age 20-24 and student socio-economic status, related to the typical age for university study.
- Ethnicity White and country of birth UK
- Ethnicity asian and country of birth other

Significant negative correlation occurs between the following:

- Age 0-4 and age 60-64
- Age 0-4 and age 65-74
- Age 30-44 and age 65-74
- Age 25-29 and country of birth UK
- Ethnicity white and ethnicity asian
- Ethnicity white and country of birth other
- Social economic status 1 and social economic status 6
- Social economic status 1 and social economic status 7
- Social economic status 2 and social economic status 6

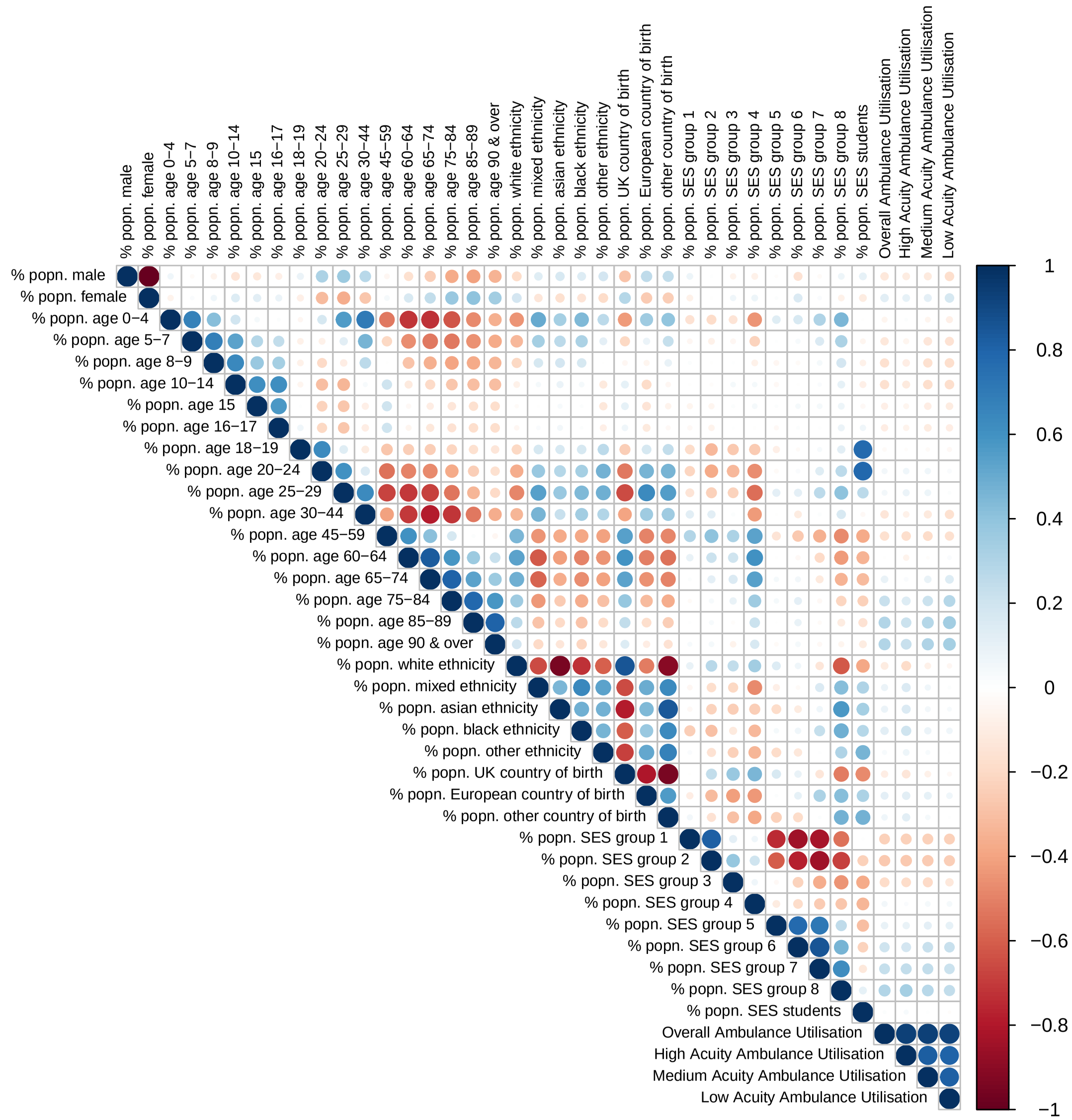

Figure 5-34: Correlation matrix of socio-demographic factors

- Social economic status 2 and social economic status 7

5.4 General health status

General health status is proposed as a moderating factor within the ITMDEHS. The dataset used within this study comes from the Census where the question is asked in relation to individuals general health and recorded on a 5 category scale as follows:

- Very good health
- Good health
- Fair health
- Bad health
- Very bad health

On average, within LSOAs most of the population report their health status as being fair (12,967%), good (35.298%) or very good (47.028%) (See Table 5.14).

Geographic distribution as very good health is reported more readily in the Bedfordshire and Hertfordshire area as shown in Figure 5-35, by darker blue areas. Where as very bad health is more prevalent in rural coastal areas (See Figure 5-36).

Table 5.14: Descriptive statistics of the proportion of each LSOA population by census recorded general health status (GHS)

Proportion of LSOA popn.	Mean	St. Dev.	Min	Max
GHS Very good	47.028	6.454	22.739	68.870
GHS Good	35.298	2.607	25.197	43.709
GHS Fair	12.967	3.332	3.740	28.119
GHS Bad	3.668	1.487	0.339	15.298
GHS Very bad	1.039	0.577	0.000	9.765

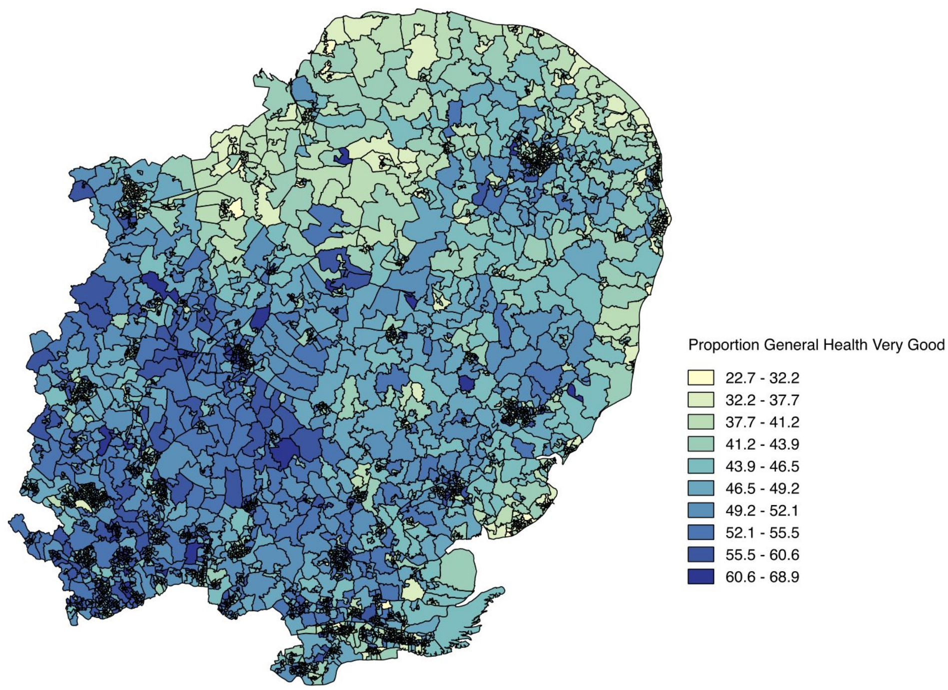

Figure 5-35: Proportion of population stating general health stature as very good in the census for each LSOA

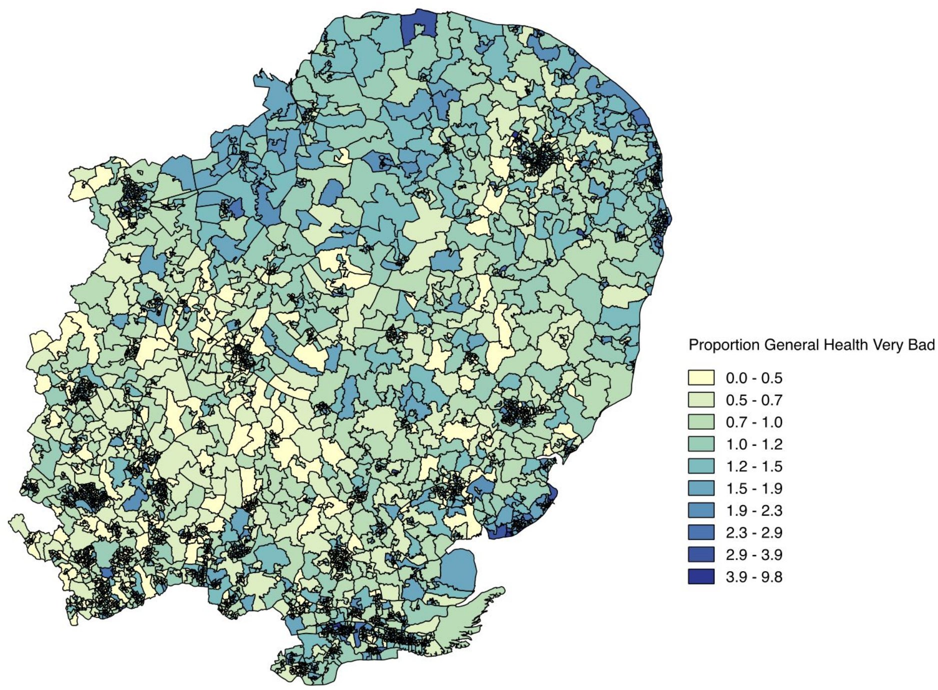

Figure 5-36: Proportion of the population stating general health status as very bad in the census for each LSOA

5.5 Social networks

The study utilised four variables proposed to be related to social networks:

- Close-knit neighbourhood
- People willing to help neighbours
- Number of friendships
- Local friendships

The hypothesis is that a stronger close-knit neighbourhood with people willing to help combined with a large close support network should decrease ambulance utilisation through moderation. This is based on the support network encouraging early use of alternatives rather than 999 including self help. However, an alternative hypothesis may be true which is that a worried group of friends may encourage increased usage especially in a developing societal culture of fear with a 'you really ought to get checked' mentality (Füredi 2006). It is possible that those isolated from a neighbourhood may delay or not utilise the ambulance service for fear of consequence.

Data was available from 1419 LSOA for the close knit neighbourhood and the willing to help neighbours questions. 1411 areas for recording of friends in the same area and 1277 areas for number of friends. The number of friends is a free answer question and the range was from 0 to 150 with a mean of 5.465 (See Table 5.15).

The LSOAs represented in the study are evenly distributed across the region as is the variation in reporting of close knit communities (See Figure 5-37).

5.6 Self efficacy

Self efficacy relates to the extent in which people believe they are capable of performing specific behaviours to attain goals. The Understanding Society dataset uses the generalised self efficacy scale (Schwarzer & Jerusalem 2010).

Table 5.15: Descriptive statistics of the proportion of each LSOA population by Understanding Society recording of close knit neighbourhood, willing to help neighbours, number of friends & same area friends

Proportion of LSOA popn.	LSOA	Mean	St. Dev.	Min	Max
Close Knit Neighbourhood	1,419	3.030	0.900	0.000	5.000
Willing to Help Neighbours	1,419	3.409	0.870	0.000	5.000
Number of Friends	1,277	5.465	6.277	0.000	150.000
Same Area Friends	1,411	3.056	0.909	1.000	5.000

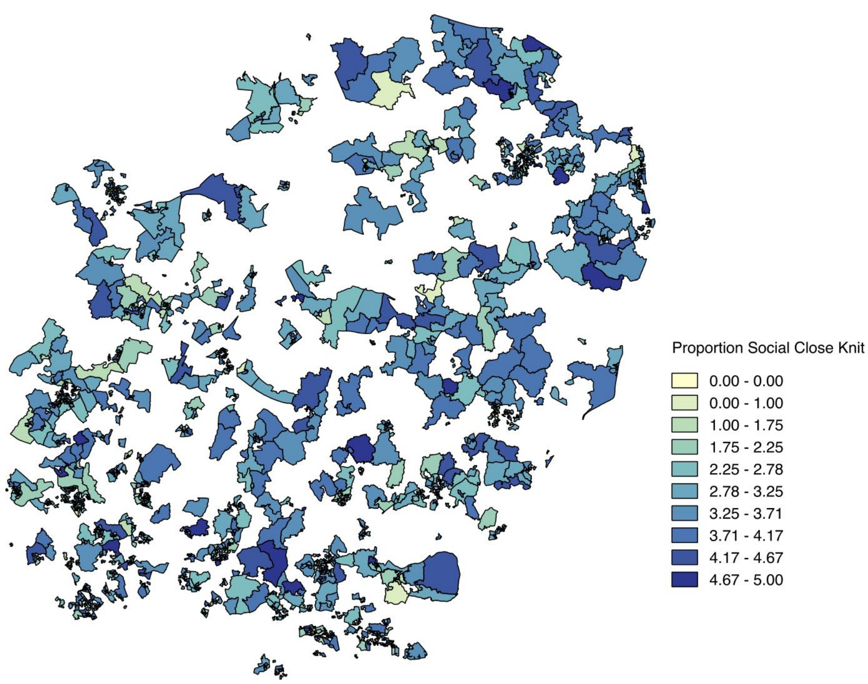

Figure 5-37: LSOA aggregated rating of of close knit neighbourhood from understanding society survey

Each of the 10 statements is scored separately on the following:

1. Not at all true
2. Hardly true
3. Moderately true
4. Exactly true

This uses 10 descriptive statements:

1. I can always manage to solve difficult problems if I try hard enough.
2. If someone opposes me, I can find the means and ways to get what I want.
3. It is easy for me to stick to my aims and accomplish my goals.
4. I am confident that I could deal efficiently with unexpected events.
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.
6. I can solve most problems if I invest the necessary effort.
7. I can remain calm when facing difficulties because I can rely on my coping abilities.
8. When I am confronted with a problem, I can usually find several solutions.
9. If I am in trouble, I can usually think of a solution.
10. I can usually handle whatever comes my way

The grouped data for the LSOAs covered 1318 areas and the mean and standard deviation were similar for all questions, other than question 2 (See Table 5.16).

Self efficacy does not show an obvious clustered pattern across the region (See Figure 5-38).

Table 5.16: Descriptive statistics of the proportion of each LSOA population by Understanding Society rating of Self Efficacy

Proportion of LSOA popn.	Mean	St. Dev.	Min	Max
Self efficacy question 1	2.317	0.463	0.000	3.000
Self efficacy question 2	1.761	0.516	0.000	3.000
Self efficacy question 3	2.001	0.453	0.000	3.000
Self efficacy question 4	2.150	0.457	0.000	3.000
Self efficacy question 5	2.113	0.467	0.000	3.000
Self efficacy question 6	2.250	0.450	0.000	3.000
Self efficacy question 7	2.144	0.493	0.000	3.000
Self efficacy question 8	2.126	0.460	0.000	3.000
Self efficacy question 9	2.197	0.443	0.000	3.000
Self efficacy question 10	2.211	0.450	0.000	3.000
Self efficacy total	21.270	3.401	1.000	30.000

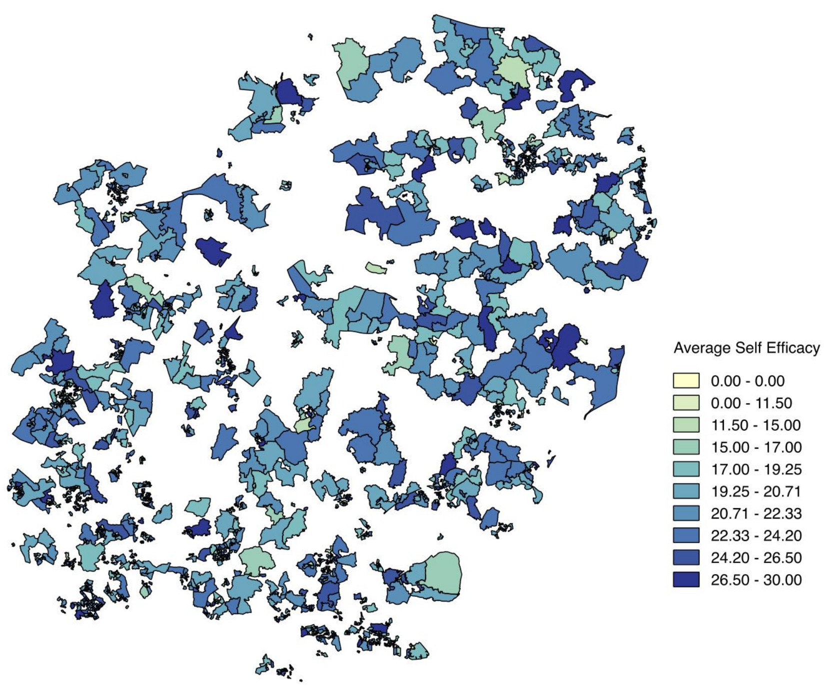

Figure 5-38: LSOA aggregated self efficacy rating from understanding society survey

5.7 Access to services

Access to services is not explicit in the ITMDEHS as a moderator. However, the literature identified that choosing emergency provision may be dependent on the availability and proximity of other services and this fits with the choice options within health behaviour theories.

Three types of measure were considered; ability to access services, distance to services and perceived quality of services:

- Ability to access services when needed (Understanding Society)
- Travel times to local Hospital and General Practitioner (Department of Transport)
- Quality of local healthcare facilities (Understanding Society)

5.7.1 Ability to access

The Understanding society neighbourhood module was accessed for variable c_servacc which asks the question of participants 'Are you able to access all services such as healthcare, food shops or learning facilities when you need to ?'. It is answered using either yes or no. The survey has 49,739 records for this question. Cross-matching to households within East of England gives 4,182 individual records for inclusion. Grouping individual records to matched LSOA showed 1,419 coverage of the 3,614 (39.26%). The averaged score for the LSOA were used, giving a maximum of 4, and minimum of 0 for quality of medical services (See Table 5.17).

Table 5.17: Descriptive statistics of 1,149 LSOAs rating from Understanding Society for rating of access to services and quality of local medical services

Proportion of popn.	Mean	St. Dev.	Min	Max
Ability to access services	0.903	0.195	0.000	1.000
Quality of medical services	2.625	0.786	0.000	4.000

A significant number, 93% of LSOAs were 100% positive to the ability to access services question and the mean therefore was high at 0.903.

5.7.2 Travel times

The Department of Transport dataset JTS050 (travel times to nearest hospital) and JTS0505 (travel times to nearest general practitioner) were utilised.

Variables utilised were: HOSPO101 - Travel time to nearest hospital by public transport or walking HOSPO119 - Travel time to nearest hospital by car GP101 - Travel to time to nearest General Practitioner by public transport or walking. GP119 - Travel time to nearest General Practitioner by car.

Table 5.18: Descriptive statistics of the Department of Transport travel times to hospital and GP by car and public transport for each LSOA

LSOA travel time (minutes)	Mean	St. Dev.	Min	Max
Hospital by public transport	43.488	20.043	5	120
Time to hospital by car	19.747	7.606	6	50
Time to GP by public transport	12.224	7.142	1	83
Time to GP by car	8.258	1.711	6	17

Travel time to the nearest hospital by car ranged from 6 minutes to 50 minutes and from 5 to 120 minutes by public transport (See Table 5.18). Travel times to general practice ranged from 6 minutes to 17 minutes by car and 1 minute to 83 minutes by public transport. Figures 5-39 & 5-40) show the hospital locations and dispersed coverage of general practice.

5.7.3 Quality of services

The Understanding Society dataset has questions related to the quality of facilities and accessibility. This asks the participants to rate local area medical facilities on the following scale:

1. Excellent

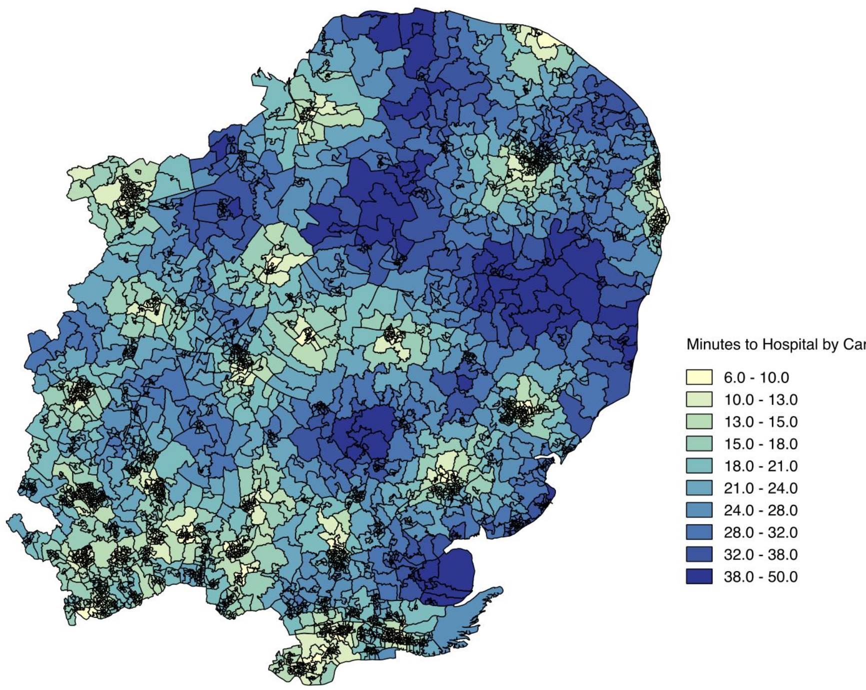

Figure 5-39: Travel time to nearest hospital by car from centre of each LSOA

2. Very Good

3. Fair

4. Poor

Data was available for 1,419 LSOAs. The data for each LSOA was aggregated and a mean calculated for the area. The mean score was 2.625, and standard deviation 0.786 (See Table 5.17).

5.8 Correlation matrix

Figure 5-41 shows a final correlation matrix of all the relationships between the factors. Negative correlations are shown in red, with depth of colour indicating strength. Positive relationships are shown in blue, with depth of colour again showing strength.

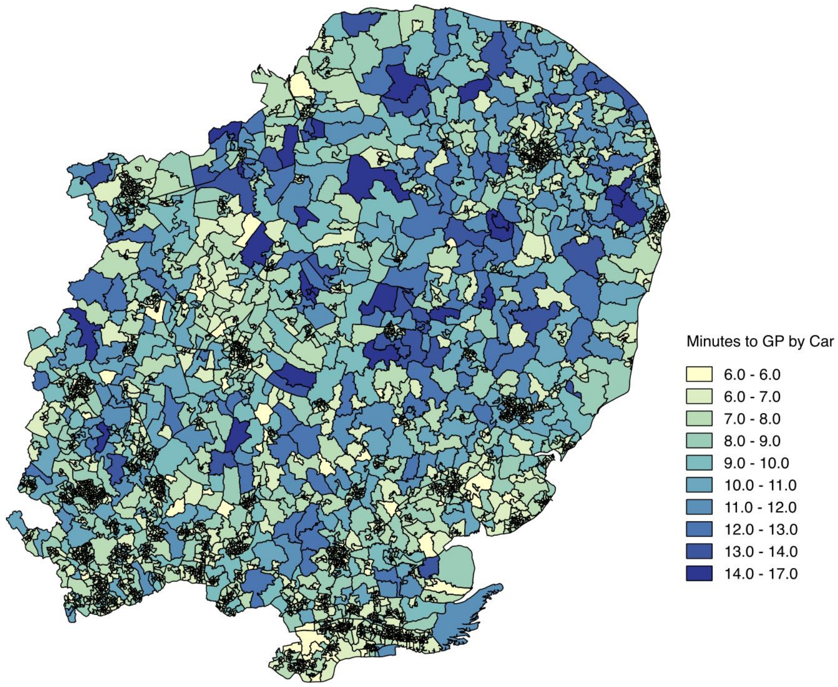

Figure 5-40: Travel time to nearest GP by car from centre of each LSOA

Where missing variables were identified pairwise reduction was utilised in the correlation analysis.

Multi-collinearity is a known issue, especially in studies with socio-demographic factors. The matrix clearly identifies the strong relationship between some of the socio-demographic factors as previously outlined.

5.9 Summary

Within this study the hypothesis is that a number of independent variables (socio-demographics) determine ambulance utilisation rates and these are then moderated by other factors.

This chapter has described the ambulance data and identified the variation in ambulance utilisation between geographical areas after workday population was

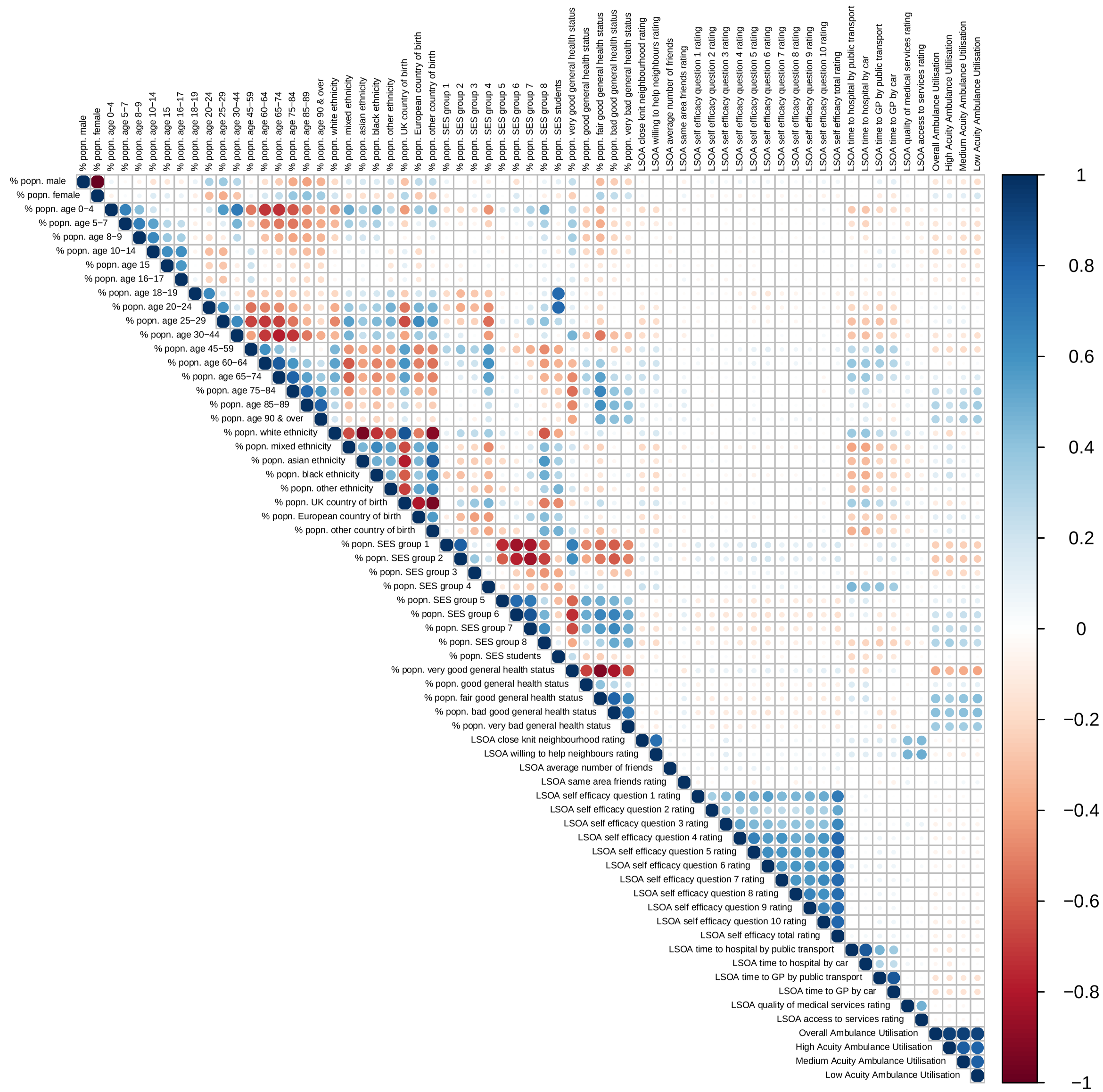

Figure 5-41: Correlation matrix of all measures of socio-demographics, general health status, access to services, social networks and self efficacy

mitigated for. It has identified that variations in the proportions of the LSOA population for each age category, ethnic group, country of birth, socio-economic status and gender have varying correlation strengths and direction with ambulance utilisation. The four moderating constructs have been outlined with accessible data covering a suitable proportion of LSOAs. The next chapter will explore through regression modelling how the dependent variables and proposed moderating factors interact.

Chapter 6

Model testing

6.1 Introduction

The previous chapter identified geographical variation in ambulance utilisation and correlations with a range of socio-demographic factors as identified from the literature. This chapter explores models for overall, high, medium and low acuity ambulance utilisation in relation to the combined socio-demographics on LSOA population. It explores four theoretically identified moderating factors using Confirmatory Factor Analysis followed by Moderated Multiple Regression Analysis (See Figure 6-1).

6.2 Analysis summary

The dependent variables utilised were overall, high, medium and low acuity utilisation per 1,000 of the population. These were transformed using the Johnson transformation to achieve normality for use in the regression analysis.

The independent variables were the percentage of population for each category of age, gender, country of birth, ethnicity and socio-economic status. These were not transformed as no assumption of normality is applied in multiple regression analysis to independent variables (Tabachnick & Fidell 2013).

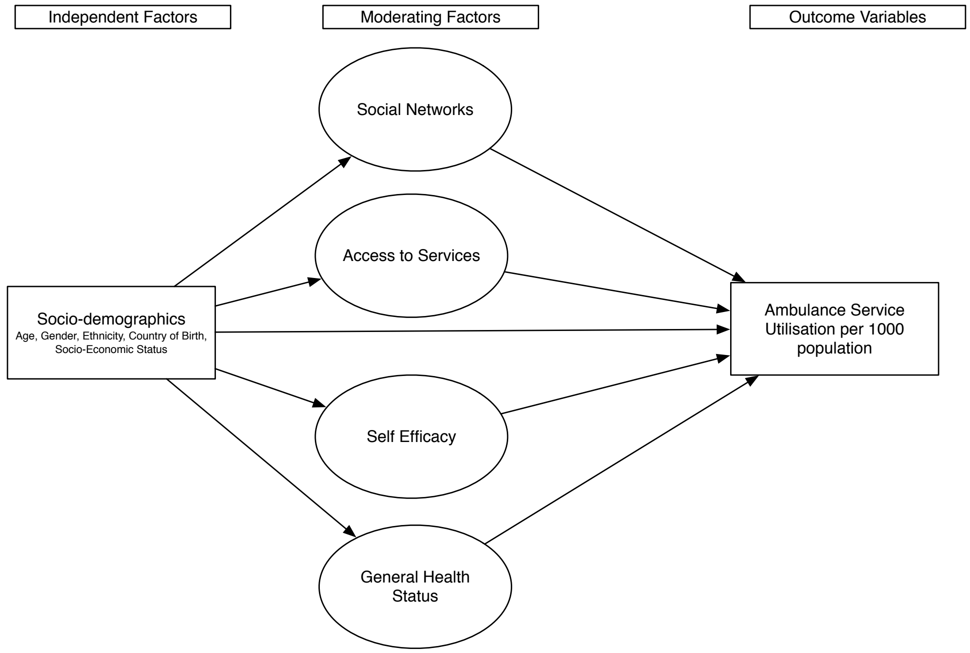

Figure 6-1: Model to be tested

Outliers were initially examined for in all variables by considering those with a standard deviation greater or lower than 3 from the mean value. This identified over 3,000 cases even after avoiding a substantial minority of variables. Excluding all these outliers would have resulted in less than 10% of LSOAs being included and therefore would have substantially decreased statistical power. Further exploration of the outliers suggested that they were not likely to be due to measurement area or recording issues. Therefore no cases were dropped in the final analysis. Within big data analysis it is common practice to include all available data with the outliers (Mayer-Schonberger & Cukier 2013).

To undertake the Moderated Multiple Regression (MMR) all independent variables were centred to avoid the issue of high multicollinearity. This was done by creating z-scores (subtraction of the mean from the original score and then division by the standard deviation). This changes the unit of analysis to variation in standard deviations. Interaction effects were calculated as products using the centred measures (Aguinis 2004). Moderation was tested for by considering the significance of the interaction effects and the difference in the adjusted R^2 (See

Appendix G for Syntax used within Stata).

During this chapter the reporting is shown as redacted multiple-regression output tables. These present the coefficient, standard error, t, probability of t and the standardised Beta for the added moderating variable and the interaction terms of each socio-demographic with the moderator. The direct socio-demographic results are not included, but the complete analysis output can be found in Appendix H for reference.

The ΔR^2 will be reported for each model stating the difference between the model with and without the interactions. If moderation is present you would expect a difference in the R^2 values once interactions were added.

6.2.1 Comparison model

The regression analysis was carried out using a comparison model due to high collinearity of the socio-demographic variables, the group was established as:

- Proportion of the population as female
- Proportion of the population aged 30-45
- Proportion of the population as white ethnicity
- Proportion of the population with a UK country of birth
- Proportion of the population with Socio-economic status group 1 (higher managerial, administrative and professional occupations)

However, initial analysis still using these comparators still rejected a number of predictors based on the SES groups. A validated alternative three class model exists for SES, aggregating the eight classes as follows:

- Class 1 - Higher managerial, administrative and professional occupations. Combining SES groups 1 & 2.
- Class 2 - Intermediate occupations. Combining SES groups 3, 4 & 5.
- Class 3 - Routine and manual occupations. Combining SES groups 6 & 7.

The SES groups 'never worked and long-term unemployed' and 'students' remain separated. Utilising the three class structure with SES group 8 and students did not reject any predictors, and was therefore used in the final analysis and dropped from the comparator group. Final comparator group was therefore; female, ages 30-45, white ethnicity & UK country of birth.

6.3 Socio-demographic impact

The first four regression models produced considered the impact of socio-demographics against the dependent variable of all emergency calls received per 1,000 of the population for overall and each acuity level against the comparator group.

6.3.1 Overall

A multiple linear regression was calculated to predict calls per 1,000 of the population on the socio-demographic variables for 3,610 LSOAs. A significant regression equation was found ($F(27, 3582)=44.81$, $p<0.001$), with an adjusted R^2 of 0.2469 (See Table 6.1).

The regression analysis in Table 6.1 shows older ages, non white ethnic groups, european country of births and SES group 8 to be predictive of increased ambulance utilisation against comparator group:

- Age 85-90 (β=0.067)
- Age 90 and over (β=0.114)
- Ethnicity mixed (β=0.082)
- Ethnicity black (β=0.071)
- European country of birth (β=0.044)
- SES group 8 (β=0.278)

Table 6.1: Results of multiple regression analysis of socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) on overall Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Age 0-4	-0.161	0.041	-3.923***	0.000	-0.144
Age 5-7	-0.047	0.030	-1.546	0.122	-0.042
Age 8-9	-0.076	0.026	-2.934**	0.003	-0.068
Age 10-14	-0.104	0.032	-3.288**	0.001	-0.093
Age 15	-0.006	0.022	-0.295	0.768	-0.006
Age 16-17	-0.048	0.024	-2.029*	0.043	-0.043
Age 18-19	-0.202	0.030	-6.714***	0.000	-0.182
Age 20-24	-0.106	0.047	-2.223*	0.026	-0.095
Age 25-29	-0.102	0.052	-1.950	0.051	-0.092
Age 45-59	-0.081	0.037	-2.178*	0.029	-0.073
Age 60-64	-0.079	0.038	-2.085*	0.037	-0.071
Age 65-74	-0.059	0.049	-1.220	0.222	-0.053
Age 75-84	0.016	0.043	0.367	0.714	0.014
Age 85-89	0.074	0.037	2.004*	0.045	0.067
Age 90 & Over	0.127	0.029	4.432***	0.000	0.114
Male	-0.059	0.021	-2.814**	0.005	-0.053
Mixed Ethnicity	0.091	0.026	3.547***	0.000	0.082
Asian Ethnicity	-0.103	0.038	-2.702**	0.007	-0.092
Black Ethnicity	0.078	0.026	3.017**	0.003	0.071
Other Ethnicity	-0.080	0.024	-3.378***	0.001	-0.072
European Country of Birth	0.049	0.025	2.011*	0.044	0.044
Other Country of Birth	-0.018	0.048	-0.378	0.706	-0.016
SES Class 1	-0.248	0.094	-2.629**	0.009	-0.446
SES Class 2	-0.026	0.040	-0.660	0.510	-0.047
SES Class 3	-0.132	0.059	-2.222*	0.026	-0.356
SES Students	0.031	0.107	0.286	0.775	0.027
SES Group 8	0.310	0.069	4.472***	0.000	0.278
_cons	-0.027	0.016	-1.663	0.096	
R^2	0.252				
F	44.811				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

A larger group of population socio-demographic factors were predictive of decreasing ambulance utilisation against comparator group:

- Age 0-4 (β=-0.144)
- Age 8-9 (β=-0.068)
- Age 10-14 (β=-0.093)
- Age 16-17 (β=-0.043)
- Age 18-19 (β=-0.182)
- Age 20-24 (β=-0.095)
- Age 45-59 (β=-0.073)
- Age 60-64 (β=-0.071)
- Male (β=-0.053)
- Ethnicity asian (β=-0.092)
- Ethnicity other (β=-0.016)
- SES class 1 (β=-0.446)
- SES class 3 (β=-0.356)

6.3.2 High acuity

A model was constructed with the high acuity call utilisation per 1,000 of the population. Again a significant regression equation was found ($F(27,3582)=40.11$, $p<0.001$), with an adjusted R^2 of 0.2264 (See Table 6.2). This model predicted slightly less than the overall model (Adjusted R^2 of 0.2469).

For high acuity the same factors had significance as overall with the addition of Ages 25-29 (β=-0.105) and european country of birth(β=-0.091). Factors no longer significant in the model were Asian ethnicity, ages 85-90, other country of birth and SES class 1 & 3.

Table 6.2: Results of multiple regression analysis of socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) on high acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Age 0-4	-0.143	0.041	-3.507***	0.000	-0.131
Age 5-7	-0.048	0.030	-1.591	0.112	-0.044
Age 8-9	-0.068	0.026	-2.623**	0.009	-0.062
Age 10-14	-0.102	0.031	-3.259**	0.001	-0.094
Age 15	0.003	0.022	0.153	0.878	0.003
Age 16-17	-0.062	0.023	-2.650**	0.008	-0.057
Age 18-19	-0.197	0.030	-6.585***	0.000	-0.181
Age 20-24	-0.129	0.047	-2.737**	0.006	-0.118
Age 25-29	-0.114	0.052	-2.205*	0.028	-0.105
Age 45-59	-0.050	0.037	-1.362	0.173	-0.046
Age 60-64	-0.088	0.038	-2.321*	0.020	-0.080
Age 65-74	-0.065	0.048	-1.353	0.176	-0.060
Age 75-84	-0.006	0.042	-0.144	0.885	-0.006
Age 85-89	0.042	0.037	1.152	0.249	0.039
Age 90 & Over	0.116	0.028	4.078***	0.000	0.107
Male	-0.052	0.021	-2.489*	0.013	-0.047
Mixed Ethnicity	0.137	0.026	5.360***	0.000	0.126
Asian Ethnicity	-0.001	0.038	-0.025	0.980	-0.001
Black Ethnicity	0.128	0.026	4.969***	0.000	0.118
Other Ethnicity	-0.065	0.024	-2.763**	0.006	-0.060
European Country of Birth	0.023	0.024	0.959	0.337	0.021
Other Country of Birth	-0.099	0.048	-2.069*	0.039	-0.091
SES Class 1	-0.170	0.094	-1.811	0.070	-0.311
SES Class 2	0.001	0.039	0.023	0.981	0.002
SES Class 3	-0.079	0.059	-1.341	0.180	-0.217
SES Students	0.122	0.106	1.154	0.249	0.112
SES Group 8	0.330	0.069	4.795***	0.000	0.302
_cons	-0.018	0.016	-1.157	0.247	
R^2	0.232				
F	40.109				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

6.3.3 Medium acuity

A model was constructed with medium acuity call utilisation per 1,000 of the population, covering less LSOAs(3,540), as a number of LSOAs did not have any medium category calls. A significant regression equation was found ($F(27,3512)=41.07$, $p<0.001$), with an adjusted R^2 of 0.2341 (See Table 6.3).

For medium acuity the same factors had significance as the overall model other than Ages 85-90, Male and Black ethnicity.

6.3.4 Low acuity

A model was constructed with low acuity call utilisation per 1,000 of the population, covering 3,610 LSOAs. A significant regression equation was found ($F(27,3582)=46.21$, $p<0.001$), with an R^2 of 0.2583, the highest fit model (See Table 6.4).

For low acuity ambulance utilisation the same factors had significance as the overall model apart from age groups 16-17, 20-24, mixed ethnicity and European country of birth. Age group 25-29 (β=-0.103) became a significant factor.

6.3.5 Summary

In summary the socio-demographics related to increased overall utilisation include proportion of the population in age group 85-90 and 90 & over, mixed and black ethnicity, European country of birth and SES group 8. The socio-demographics can collectively predict 24% of ambulance utilisation per 1,000 population at LSOA level.

6.4 Moderation via general health

Need is considered to be the highest determinant related to health service utilisation. A number of socio-demographic factors are related to increased need

Table 6.3: Results of multiple regression analysis of socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) on medium acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Age 0-4	-0.169	0.044	-3.870***	0.000	-0.144
Age 5-7	-0.061	0.032	-1.909	0.056	-0.053
Age 8-9	-0.061	0.028	-2.204*	0.028	-0.053
Age 10-14	-0.090	0.034	-2.693**	0.007	-0.078
Age 15	-0.004	0.023	-0.181	0.856	-0.004
Age 16-17	-0.054	0.025	-2.153*	0.031	-0.047
Age 18-19	-0.190	0.032	-5.937***	0.000	-0.164
Age 20-24	-0.131	0.051	-2.576*	0.010	-0.113
Age 25-29	-0.039	0.056	-0.695	0.487	-0.033
Age 45-59	-0.087	0.039	-2.203*	0.028	-0.074
Age 60-64	-0.098	0.040	-2.421*	0.016	-0.084
Age 65-74	0.000	0.052	0.003	0.998	0.000
Age 75-84	-0.040	0.046	-0.886	0.376	-0.035
Age 85-89	0.076	0.039	1.941	0.052	0.066
Age 90 & Over	0.167	0.030	5.493***	0.000	0.144
Male	-0.042	0.022	-1.886	0.059	-0.036
Mixed Ethnicity	0.072	0.027	2.636**	0.008	0.062
Asian Ethnicity	-0.154	0.041	-3.793***	0.000	-0.134
Black Ethnicity	0.034	0.028	1.253	0.210	0.030
Other Ethnicity	-0.064	0.026	-2.433*	0.015	-0.053
European Country of Birth	0.033	0.026	1.249	0.212	0.028
Other Country of Birth	-0.003	0.052	-0.057	0.954	-0.003
SES Class 1	-0.301	0.100	-2.997**	0.003	-0.519
SES Class 2	-0.054	0.042	-1.285	0.199	-0.094
SES Class 3	-0.159	0.063	-2.516*	0.012	-0.411
SES Students	-0.013	0.113	-0.117	0.907	-0.011
SES Group 8	0.295	0.074	4.008***	0.000	0.255
_cons	-0.008	0.017	-0.477	0.633	
R^2	0.240				
F	41.069				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

Table 6.4: Results of multiple regression analysis of socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) on low acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Age 0-4	-0.122	0.038	-3.193**	0.001	-0.117
Age 5-7	-0.046	0.028	-1.626	0.104	-0.044
Age 8-9	-0.058	0.024	-2.400*	0.016	-0.056
Age 10-14	-0.095	0.029	-3.233**	0.001	-0.091
Age 15	-0.023	0.020	-1.135	0.256	-0.022
Age 16-17	-0.012	0.022	-0.550	0.583	-0.012
Age 18-19	-0.166	0.028	-5.938***	0.000	-0.160
Age 20-24	-0.047	0.044	-1.074	0.283	-0.046
Age 25-29	-0.108	0.049	-2.211*	0.027	-0.103
Age 45-59	-0.115	0.035	-3.334***	0.001	-0.111
Age 60-64	-0.078	0.035	-2.204*	0.028	-0.075
Age 65-74	-0.078	0.045	-1.719	0.086	-0.075
Age 75-84	0.055	0.040	1.392	0.164	0.053
Age 85-89	0.100	0.034	2.910**	0.004	0.097
Age 90 & Over	0.109	0.027	4.088***	0.000	0.105
Male	-0.076	0.019	-3.892***	0.000	-0.073
Mixed Ethnicity	0.020	0.024	0.816	0.414	0.019
Asian Ethnicity	-0.122	0.035	-3.456***	0.001	-0.118
Black Ethnicity	0.058	0.024	2.391*	0.017	0.056
Other Ethnicity	-0.058	0.022	-2.619**	0.009	-0.056
European Country of Birth	0.042	0.023	1.835	0.067	0.040
Other Country of Birth	-0.001	0.045	-0.029	0.977	-0.001
SES Class 1	-0.272	0.088	-3.094**	0.002	-0.522
SES Class 2	-0.033	0.037	-0.882	0.378	-0.063
SES Class 3	-0.150	0.055	-2.715**	0.007	-0.433
SES Students	-0.072	0.099	-0.730	0.465	-0.070
SES Group 8	0.229	0.065	3.552***	0.000	0.220
_cons	-0.009	0.015	-0.617	0.537	
R^2	0.258				
F	46.209				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

and the ITMDEHS predicts that general health status should moderate socio-demographics for utilisation.

This section outlines the results from the regression analysis of the hypothesis that general health status of the population moderates socio-demographics for ambulance utilisation.

General health status was initially proposed as a latent construct with the observed variables being the proportion of the population self declaring within the census (See Figure 6-2).

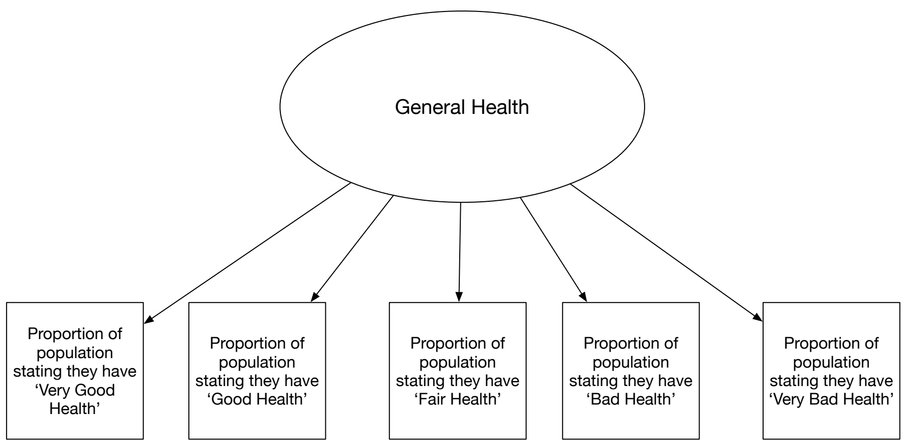

Figure 6-2: General health status latent variables

6.4.1 General health status confirmatory factor analysis

A CFA was conducted but was unable to process due to the high collinearity of the measures five measures.

An index variable was therefore created by weighting each status category as follows: general.health.status = (health.verygood*5 + health.good*4 + health.fair*3 + health.bad*2 + health.verybad*1)

This index variable was utilised in the model testing.

6.4.2 Overall

A MMR was undertaken, first introducing the general health status variable and then interaction terms of GHS with each of the socio-demographic variables.

Adding general health status produced a significant regression equation($F(28,3581)=46.38$, $p<0.001$), with an adjusted R^2 of 0.2604. This was 0.014 greater than the original model without the variable. This supports that GHS explains some of the variation in ambulance utilisation.

To test for moderation the interaction terms were added. This produced an improved significant regression equation of ($F(55,3554)=27.97$, $p<0.001$), with an adjusted R^2 of 0.2913 (See Table 6.5). This shows that with GHS and interactions added the model can explain 29% of variation in ambulance utilisation.

To establish the extent of moderation the ΔR^2 was calculated as 0.031. General health status is therefore considered a significant ($p<0.001$) moderator explaining 3% of the model.

The following socio-demographic interactions were significant within the model:

- Age 0-4 (β=-0.085)
- Age 10-14 (β=-0.085)
- Age 65-74 (β=-0.108)
- SES class 1 (β=-0.549)
- SES class 2 (β=-0.305)
- SES class 3 (β=-0.557)
- SES students (β=-0.459)

All of these are negative values and demonstrate that as general health status increases the impact on ambulance utilisation of these socio-demographic factors

Table 6.5: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and general health status on overall Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
General Health Status (GHS)	-0.482	0.058	-8.250***	0.000	-0.432
GHS x Age 0-4	-0.076	0.038	-2.007*	0.045	-0.085
GHS x Age 5-7	-0.010	0.030	-0.343	0.731	-0.012
GHS x Age 8-9	-0.016	0.026	-0.624	0.533	-0.018
GHS x Age 10-14	-0.073	0.030	-2.438*	0.015	-0.085
GHS x Age 15	-0.007	0.020	-0.319	0.750	-0.007
GHS x Age 16-17	0.031	0.021	1.454	0.146	0.036
GHS x Age 18-19	0.010	0.030	0.347	0.728	0.016
GHS x Age 20-24	-0.062	0.042	-1.488	0.137	-0.092
GHS x Age 25-29	-0.081	0.048	-1.693	0.091	-0.085
GHS x Age 45-59	-0.064	0.036	-1.792	0.073	-0.072
GHS x Age 60-64	0.026	0.037	0.694	0.488	0.027
GHS x Age 65-74	-0.087	0.044	-1.991*	0.047	-0.108
GHS x Age 75-84	-0.003	0.041	-0.082	0.935	-0.004
GHS x Age 85-89	0.065	0.034	1.908	0.056	0.087
GHS x Age 90 & Over	0.005	0.027	0.189	0.850	0.007
GHS x Male	0.026	0.019	1.422	0.155	0.032
GHS x Mixed Ethnicity	0.009	0.027	0.343	0.732	0.008
GHS x Asian Ethnicity	-0.009	0.041	-0.222	0.824	-0.006
GHS x Black Ethnicity	-0.012	0.025	-0.469	0.639	-0.010
GHS x Other Ethnicity	-0.011	0.020	-0.529	0.597	-0.012
GHS x European Country of Birth	0.020	0.025	0.793	0.428	0.018
GHS x Other Country of Birth	0.004	0.047	0.094	0.925	0.004
GHS x SES Class 1	-0.277	0.091	-3.031**	0.002	-0.549
GHS x SES Class 2	-0.143	0.038	-3.779***	0.000	-0.305
GHS x SES Class 3	-0.188	0.057	-3.268**	0.001	-0.557
GHS x SES Students	-0.286	0.101	-2.831**	0.005	-0.459
GHS x SES Group 8	-0.104	0.064	-1.636	0.102	-0.101
_cons	0.056	0.020	2.796**	0.005	
R^2	0.302				
F	27.971				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

Comparators: Female, Age 30-45, White, UK decreases.

6.4.3 High acuity

Models were then calculated for high acuity ambulance utilisation. Addition of general health status yielded a significant model ($F(28,3581)=42.61$, $p<0.001$), with an adjusted R^2 of 0.2421. Addition of the interaction terms produced $F(55,3554)=24.77$, adjusted R^2 0.2659 (See Table 6.6).

The moderation interactions were significant for:

- Age 10-14 (β=-0.072)
- Age 25-29 (β=-0.115)
- Age 65-74 (β=-0.138)
- SES class 1 (β=-0.614)
- SES class 2 (β=-0.345)
- SES class 3 (β=-0.631)
- SES students (β=-0.598)
- SES group 8 (β=-0.135)

Again all of these interactions show negative values demonstrating the moderating affect of general health status of impact on ambulance utilisation.

The ΔR^2 between the models was 0.024. This demonstrates that general health status moderates for high acuity ambulance utilisation.

6.4.4 Medium acuity

MMR models were also calculated for medium acuity ambulance utilisation. Addition of general health status yielded a significant model ($F(28,3551)=41.77$,

Table 6.6: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and general health status on high acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
General Health Status (GHS)	-0.487	0.058	-8.373***	0.000	-0.447
GHS x Age 0-4	-0.058	0.038	-1.549	0.121	-0.067
GHS x Age 5-7	-0.009	0.030	-0.309	0.758	-0.011
GHS x Age 8-9	-0.033	0.025	-1.279	0.201	-0.037
GHS x Age 10-14	-0.060	0.030	-2.024*	0.043	-0.072
GHS x Age 15	-0.010	0.020	-0.473	0.636	-0.011
GHS x Age 16-17	0.021	0.021	0.982	0.326	0.025
GHS x Age 18-19	0.019	0.030	0.650	0.516	0.031
GHS x Age 20-24	-0.028	0.041	-0.671	0.502	-0.042
GHS x Age 25-29	-0.108	0.048	-2.258*	0.024	-0.115
GHS x Age 45-59	-0.057	0.036	-1.608	0.108	-0.065
GHS x Age 60-64	0.036	0.037	0.970	0.332	0.039
GHS x Age 65-74	-0.109	0.043	-2.508*	0.012	-0.138
GHS x Age 75-84	0.010	0.040	0.255	0.799	0.014
GHS x Age 85-89	0.040	0.034	1.171	0.242	0.054
GHS x Age 90 & Over	0.007	0.027	0.261	0.794	0.009
GHS x Male	0.023	0.019	1.268	0.205	0.029
GHS x Mixed Ethnicity	0.025	0.027	0.944	0.345	0.023
GHS x Asian Ethnicity	-0.001	0.041	-0.027	0.979	-0.001
GHS x Black Ethnicity	-0.022	0.025	-0.873	0.383	-0.020
GHS x Other Ethnicity	-0.024	0.020	-1.166	0.244	-0.027
GHS x European Country of Birth	0.005	0.025	0.183	0.855	0.004
GHS x Other Country of Birth	0.023	0.047	0.496	0.620	0.022
GHS x SES Class 1	-0.303	0.091	-3.327***	0.001	-0.614
GHS x SES Class 2	-0.158	0.038	-4.197***	0.000	-0.345
GHS x SES Class 3	-0.208	0.057	-3.637***	0.000	-0.631
GHS x SES Students	-0.365	0.101	-3.623***	0.000	-0.598
GHS x SES Group 8	-0.136	0.064	-2.145*	0.032	-0.135
_cons	0.045	0.020	2.228*	0.026	
R^2	0.277				
F	24.770				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

$p<0.001$), with an adjusted R^2 of 0.2439. Addition of the interaction terms produced $F(55,3484)=24.83$, adjusted R^2 0.2703 (See Table 6.7).

The moderation interactions were significant for:

- Age 0-4 (β=-0.369)
- Age 20-24 (β=-0.172)
- Age 45-59 (β=-0.085)
- Age 85-90 (β=0.104)

As all of these relate to age, GHS is changing the impact this has on ambulance utilisation. The β is positive for age group 85-90, this suggests that as the GHS of the population increases the impact of age increases on ambulance utilisation.

The ΔR^2 between the models was 0.026. General health status moderates for medium acuity ambulance utilisation.

6.4.5 Low acuity

Models were finally run for low acuity ambulance utilisation. Addition of general health status yielded a significant model ($F(28,3581)=47.16$, $p<0.001$), with an adjusted R^2 of 0.2637. Addition of the interaction terms produced $F(55,3554)=27.96$, adjusted R^2 0.2912 (See Table 6.8).

The moderation interactions were significant for:

- Age 10-14 (β=-0.089)
- Age 65-74 (β=-0.110)
- Age 85-90 (β=0.115)
- SES class 1 (β=-0.550)
- SES class 2 (β=-0.319)
- SES class 3 (β=-0.543)

Table 6.7: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and general health status on medium acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
General Health Status (GHS)	-0.431	0.062	-6.907***	0.000	-0.369
GHS x Age 0-4	-0.096	0.041	-2.356*	0.019	-0.101
GHS x Age 5-7	0.005	0.032	0.143	0.887	0.005
GHS x Age 8-9	-0.008	0.028	-0.280	0.779	-0.008
GHS x Age 10-14	-0.056	0.032	-1.743	0.081	-0.062
GHS x Age 15	-0.009	0.022	-0.415	0.678	-0.010
GHS x Age 16-17	0.018	0.023	0.785	0.432	0.020
GHS x Age 18-19	-0.062	0.032	-1.913	0.056	-0.095
GHS x Age 20-24	-0.120	0.045	-2.667**	0.008	-0.172
GHS x Age 25-29	-0.060	0.053	-1.131	0.258	-0.058
GHS x Age 45-59	-0.081	0.038	-2.121*	0.034	-0.085
GHS x Age 60-64	-0.037	0.040	-0.929	0.353	-0.037
GHS x Age 65-74	-0.047	0.047	-0.989	0.323	-0.055
GHS x Age 75-84	-0.002	0.044	-0.052	0.958	-0.003
GHS x Age 85-89	0.082	0.037	2.233*	0.026	0.104
GHS x Age 90 & Over	-0.005	0.029	-0.157	0.876	-0.006
GHS x Male	0.035	0.020	1.766	0.077	0.041
GHS x Mixed Ethnicity	-0.001	0.029	-0.017	0.986	-0.000
GHS x Asian Ethnicity	-0.014	0.045	-0.304	0.761	-0.008
GHS x Black Ethnicity	-0.034	0.027	-1.258	0.208	-0.029
GHS x Other Ethnicity	-0.019	0.022	-0.857	0.392	-0.020
GHS x European Country of Birth	0.015	0.027	0.561	0.575	0.014
GHS x Other Country of Birth	0.027	0.051	0.533	0.594	0.024
GHS x SES Class 1	-0.169	0.099	-1.715	0.086	-0.321
GHS x SES Class 2	-0.073	0.041	-1.797	0.072	-0.149
GHS x SES Class 3	-0.104	0.062	-1.687	0.092	-0.297
GHS x SES Students	-0.070	0.108	-0.644	0.520	-0.108
GHS x SES Group 8	-0.047	0.069	-0.683	0.494	-0.043
_cons	0.075	0.021	3.502***	0.000	
R^2	0.282				
F	24.833				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

Table 6.8: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and general health status on low acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
General Health Status (GHS)	-0.405	0.055	-7.424***	0.000	-0.389
GHS x Age 0-4	-0.043	0.035	-1.222	0.222	-0.052
GHS x Age 5-7	-0.006	0.028	-0.222	0.825	-0.008
GHS x Age 8-9	0.015	0.024	0.627	0.530	0.018
GHS x Age 10-14	-0.072	0.028	-2.566*	0.010	-0.089
GHS x Age 15	-0.008	0.019	-0.406	0.685	-0.009
GHS x Age 16-17	0.038	0.020	1.930	0.054	0.048
GHS x Age 18-19	0.008	0.028	0.298	0.766	0.014
GHS x Age 20-24	-0.054	0.039	-1.391	0.164	-0.086
GHS x Age 25-29	-0.053	0.045	-1.182	0.237	-0.059
GHS x Age 45-59	-0.034	0.033	-1.017	0.309	-0.041
GHS x Age 60-64	0.033	0.035	0.964	0.335	0.038
GHS x Age 65-74	-0.083	0.041	-2.033*	0.042	-0.110
GHS x Age 75-84	0.018	0.038	0.481	0.631	0.026
GHS x Age 85-89	0.081	0.032	2.539*	0.011	0.115
GHS x Age 90 & Over	-0.006	0.026	-0.227	0.820	-0.008
GHS x Male	0.027	0.017	1.578	0.115	0.035
GHS x Mixed Ethnicity	-0.015	0.025	-0.602	0.547	-0.015
GHS x Asian Ethnicity	-0.037	0.039	-0.958	0.338	-0.025
GHS x Black Ethnicity	-0.005	0.023	-0.216	0.829	-0.005
GHS x Other Ethnicity	0.004	0.019	0.191	0.848	0.004
GHS x European Country of Birth	0.033	0.023	1.421	0.156	0.033
GHS x Other Country of Birth	0.034	0.044	0.774	0.439	0.034
GHS x SES Class 1	-0.259	0.085	-3.035**	0.002	-0.550
GHS x SES Class 2	-0.140	0.035	-3.958***	0.000	-0.319
GHS x SES Class 3	-0.171	0.054	-3.182**	0.001	-0.543
GHS x SES Students	-0.250	0.094	-2.644**	0.008	-0.429
GHS x SES Group 8	-0.123	0.060	-2.066*	0.039	-0.128
_cons	0.058	0.019	3.064**	0.002	
R^2	0.302				
F	27.963				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

- SES students (β=-0.429)
- SES group 8 (β=-0.128)

These results are more similar to high acuity utilisation than medium acuity and are outlying moderation on a greater number of factors.

The ΔR^2 was 0.028. General health status also moderates for low acuity ambulance utilisation.

6.4.6 Summary

General health status, as predicted in the ITMDEHS is a significant moderator for socio-demographics on all acuities of ambulance utilisation but greater for medium, low and overall categories of call.

6.5 Moderation via social networks

Social networks is identified as a modifying factor for emergency health utilisation within the theoretical model. To create a measure for this concept four variables were proposed from Understanding Society to form a latent variable (See Figure 6-3).

The hypothesis to test was that Social network status of the population would moderate socio-demographics for ambulance utilisation.

6.5.1 Social networks confirmatory factor analysis

A CFA was conducted for the proposed latent variables. The model did not have a high reliability. Chi^2=0.89, prob > Chi^2=0.6399. TLI=1.004 & CFI=1.000.

The Cronbach's alpha was below the level of reliability at 0.4967.

Therefore moderation analysis was undertaken using MMR for each of the four factors independently rather than creating a latent variable.

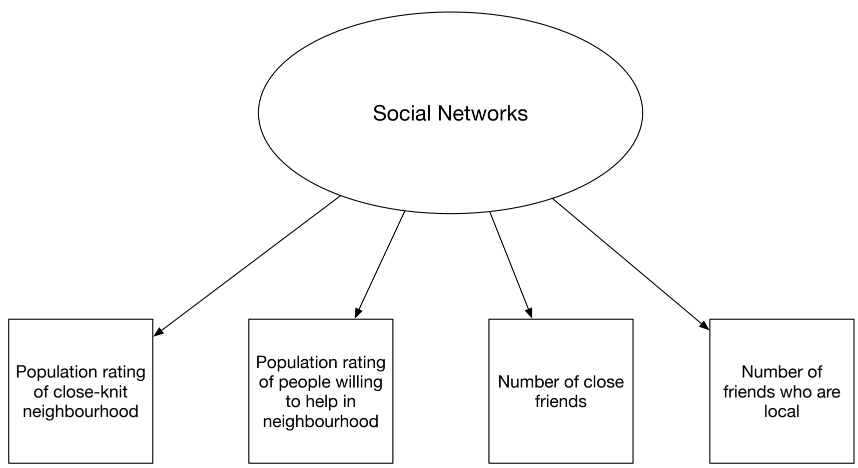

Figure 6-3: Social networks latent variables

6.5.2 Close knit neighbourhood

Eight models were constructed for analysis of overall, high, medium and low acuity ambulance utilisation. The initial model was created by adding the close knit neighbourhood (CKN) variable and then a second model run with interaction terms for CKN with each socio-demographic factor.

Addition of the CKN variable continued to produce significant models ($p<0.001$) in all cases. However, in the overall model the factor was not deemed to be significant ($p=0.606$) and no interactions were significant (See Table 6.9). This was mirrored in the models for all other acuity categories.

For overall utilisation the ΔR^2 was 0.004, for high acuity utilisation it was 0.003, for medium acuity ambulance utilisation it was 0.001 and for low acuity utilisation it was 0.004. The low values of the difference in R^2 combined with non significance of any interaction factors demonstrates that close knit neighbourhood was not a moderator of socio-demographics on ambulance utilisation for any category of acuity.

6.5.3 Willing to help neighbours

The second social network measure to test was population view on willingness to help neighbours. Eight models were constructed for overall, high, medium and low acuity ambulance utilisation, adding first the willing to help neighbours (WHN) variable and then the interaction terms.

Addition of the WHN variable continued to produce significant models ($p<0.001$) in all cases. However, in the overall model the factor was not deemed to be significant ($p=0.868$) and interactions were significant for age 18-19 and students only (See Table 6.10). This result was mirrored in the models for other acuity categories.

For overall ambulance utilisation the ΔR^2 between the models with and without interactions was 0.008. For high acuity utilisation it was 0.004, for medium acuity utilisation it was 0.003 and low acuity utilisation it was 0.008. These low

Table 6.9: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and close knit neighbourhood on overall Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Close Knit Neighbourhood (CKN)	0.014	0.028	0.515	0.606	0.013
CKN x Age 0-4	0.015	0.071	0.206	0.837	0.013
CKN x Age 5-7	-0.047	0.052	-0.903	0.366	-0.042
CKN x Age 8-9	0.072	0.043	1.691	0.091	0.065
CKN x Age 10-14	0.054	0.054	0.991	0.322	0.050
CKN x Age 15	-0.008	0.036	-0.220	0.826	-0.007
CKN x Age 16-17	-0.019	0.039	-0.487	0.627	-0.018
CKN x Age 18-19	-0.110	0.069	-1.605	0.109	-0.065
CKN x Age 20-24	0.003	0.079	0.040	0.968	0.003
CKN x Age 25-29	0.017	0.086	0.197	0.843	0.016
CKN x Age 45-59	0.025	0.063	0.397	0.692	0.022
CKN x Age 60-64	-0.024	0.061	-0.392	0.695	-0.022
CKN x Age 65-74	0.057	0.085	0.665	0.506	0.047
CKN x Age 75-84	-0.002	0.072	-0.032	0.975	-0.002
CKN x Age 85-89	-0.080	0.058	-1.379	0.168	-0.068
CKN x Age 90 & Over	0.061	0.046	1.323	0.186	0.054
CKN x Male	-0.062	0.033	-1.907	0.057	-0.062
CKN x Mixed Ethnicity	-0.045	0.040	-1.135	0.257	-0.044
CKN x Asian Ethnicity	-0.036	0.073	-0.497	0.620	-0.040
CKN x Black Ethnicity	0.006	0.045	0.125	0.901	0.006
CKN x Other Ethnicity	0.046	0.040	1.162	0.246	0.047
CKN x European Country of Birth	-0.052	0.042	-1.223	0.222	-0.050
CKN x Other Country of Birth	0.045	0.104	0.432	0.666	0.045
CKN x SES Class 1	0.158	0.164	0.966	0.334	0.282
CKN x SES Class 2	0.050	0.070	0.714	0.475	0.088
CKN x SES Class 3	0.101	0.104	0.975	0.330	0.259
CKN x SES Students	0.244	0.179	1.363	0.173	0.195
CKN x SES Group 8	0.066	0.122	0.547	0.585	0.069
_cons	-0.005	0.027	-0.183	0.855	
R^2	0.281				
F	9.672				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

Table 6.10: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and willing to health neighbours on overall Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Willing to Help Neighbours (WHN)	0.005	0.028	0.166	0.868	0.004
WHN x Age 0-4	-0.035	0.072	-0.481	0.631	-0.033
WHN x Age 5-7	-0.021	0.051	-0.404	0.686	-0.019
WHN x Age 8-9	0.042	0.046	0.918	0.359	0.037
WHN x Age 10-14	0.024	0.054	0.454	0.650	0.022
WHN x Age 15	0.026	0.036	0.718	0.473	0.024
WHN x Age 16-17	-0.032	0.042	-0.772	0.440	-0.028
WHN x Age 18-19	-0.139	0.063	-2.205*	0.028	-0.098
WHN x Age 20-24	-0.078	0.082	-0.951	0.342	-0.071
WHN x Age 25-29	0.011	0.087	0.121	0.904	0.010
WHN x Age 45-59	-0.012	0.064	-0.182	0.855	-0.011
WHN x Age 60-64	-0.109	0.063	-1.738	0.082	-0.101
WHN x Age 65-74	0.094	0.084	1.124	0.261	0.078
WHN x Age 75-84	-0.075	0.071	-1.056	0.291	-0.060
WHN x Age 85-89	-0.051	0.057	-0.889	0.374	-0.042
WHN x Age 90 & Over	0.069	0.048	1.421	0.156	0.059
WHN x Male	-0.031	0.036	-0.868	0.385	-0.028
WHN x Mixed Ethnicity	-0.058	0.041	-1.405	0.160	-0.060
WHN x Asian Ethnicity	-0.001	0.069	-0.015	0.988	-0.001
WHN x Black Ethnicity	0.042	0.044	0.961	0.337	0.050
WHN x Other Ethnicity	0.014	0.041	0.346	0.729	0.014
WHN x European Country of Birth	-0.058	0.041	-1.414	0.158	-0.062
WHN x Other Country of Birth	-0.069	0.095	-0.727	0.467	-0.077
WHN x SES Class 1	0.279	0.162	1.716	0.086	0.499
WHN x SES Class 2	0.106	0.069	1.526	0.127	0.195
WHN x SES Class 3	0.181	0.103	1.766	0.078	0.457
WHN x SES Students	0.469	0.179	2.614**	0.009	0.413
WHN x SES Group 8	0.206	0.119	1.736	0.083	0.236
_cons	0.005	0.027	0.182	0.856	
R^2	0.284				
F	9.819				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

values combined with non significance of factors demonstrates that willing to help neighbours was not a moderator of socio-demographics on ambulance utilisation for any acuity category.

6.5.4 Number of friends

Models were constructed for overall ambulance utilisation and each of the acuity categories; high, medium and low. The initial model was constructed by adding to the regression the LSOA population average of number of friends (NoF) stated in Understanding Society. The second model added the interaction terms of NoF with each socio-demographic factor.

Addition of the NoF variable continued to produce significant models ($p<0.001$) in all cases. However, in the overall model the factor was not deemed to be significant ($p=0.843$) and the only significant interaction was ages 18-19. This was mirrored in the models for other acuity levels (See Table 6.11).

For overall ambulance utilisation the ΔR^2 was -0.001, for high acuity utilisation 0.001, for medium acuity utilisation -0.003 and low acuity utilisation -0.001. These low values combined with non significance of factors demonstrates that the number of friends was not a moderator of socio-demographics on ambulance utilisation for any acuity category.

6.5.5 Same area friends

Models were constructed for overall ambulance utilisation and each of the acuity categories; high, medium and low. The initial model was constructed by adding to the regression the LSOA population results for same area friends (SAF) from Understanding Society. The second model added the interaction terms of SAF with each socio-demographic factor.

Addition of the SAF variable continued to produce significant models ($p<0.001$) in all cases. However, in the overall ambulance utilisation model the factor was not deemed to be significant ($p=0.661$). Significant interactions did occurr with

Table 6.11: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and number of friends on overall Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Number of Friends (NoF)	-0.010	0.051	-0.199	0.843	-0.009
NoF x Age 0-4	0.084	0.116	0.728	0.467	0.068
NoF x Age 5-7	0.106	0.106	0.997	0.319	0.076
NoF x Age 8-9	-0.054	0.091	-0.590	0.555	-0.037
NoF x Age 10-14	-0.074	0.108	-0.683	0.495	-0.069
NoF x Age 15	-0.037	0.077	-0.486	0.627	-0.035
NoF x Age 16-17	0.029	0.081	0.357	0.721	0.023
NoF x Age 18-19	0.329	0.154	2.137*	0.033	0.191
NoF x Age 20-24	0.084	0.187	0.447	0.655	0.049
NoF x Age 25-29	-0.110	0.165	-0.669	0.504	-0.096
NoF x Age 45-59	-0.022	0.113	-0.192	0.848	-0.018
NoF x Age 60-64	-0.118	0.121	-0.978	0.328	-0.118
NoF x Age 65-74	0.251	0.161	1.566	0.118	0.237
NoF x Age 75-84	-0.001	0.134	-0.007	0.995	-0.000
NoF x Age 85-89	0.071	0.126	0.561	0.575	0.047
NoF x Age 90 & Over	-0.076	0.094	-0.800	0.424	-0.067
NoF x Male	0.107	0.067	1.585	0.113	0.078
NoF x Mixed Ethnicity	-0.048	0.081	-0.592	0.554	-0.034
NoF x Asian Ethnicity	-0.126	0.124	-1.015	0.310	-0.069
NoF x Black Ethnicity	0.106	0.093	1.143	0.253	0.065
NoF x Other Ethnicity	-0.101	0.080	-1.264	0.206	-0.055
NoF x European Country of Birth	0.135	0.089	1.521	0.129	0.064
NoF x Other Country of Birth	0.098	0.131	0.743	0.458	0.055
NoF x SES Class 1	-0.178	0.303	-0.588	0.557	-0.250
NoF x SES Class 2	-0.030	0.123	-0.247	0.805	-0.034
NoF x SES Class 3	-0.193	0.192	-1.006	0.315	-0.345
NoF x SES Students	-0.528	0.349	-1.513	0.130	-0.294
NoF x SES Group 8	0.049	0.230	0.212	0.832	0.031
_cons	0.005	0.028	0.181	0.856	
R^2	0.271				
F	8.241				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

ages 45-59 and 90 & over. This was mirrored in the models for other acuity levels (See Table 6.12).

For overall ambulance utilisation the ΔR^2 was 0.003 between the models. For high acuity utilisation 0.001, for medium acuity utilisation -0.003 and low acuity utilisation 0.001. These low values combined with non significance of the factors demonstrates that same area friends was not a moderator of socio-demographics on ambulance utilisation.

6.5.6 Summary

None of the four factors (close knit neighbourhood, willing to help neighbours, number of friends & same area friends) suggested as measures of social networks were significant moderators of socio-demographics on ambulance utilisation in any of the acuity groups.

6.6 Moderation via self efficacy

Self efficacy is the factor which commonly features across the health behaviour models. It is hypothesised that self efficacy would moderate utilisation. The ten factors from the validated scale were proposed as a latent variable for the self efficacy construct.

6.6.1 Self efficacy confirmatory factor analysis

A CFA was conduced for the ten measures of self efficacy.

Results showed a good model fit with CFI of 0.936, TLI of 0.918 and RMSEA of 0.097.

The components were therefore compiled into a single latent variable for analysis in the moderated multiple regression.

Table 6.12: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and same area friends on overall Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Same Area Friends (SAF)	0.012	0.028	0.439	0.661	0.011
SAF x Age 5-7	-0.057	0.072	-0.801	0.423	-0.050
SAF x Age 5-7	-0.046	0.051	-0.895	0.371	-0.040
SAF x Age 8-9	0.046	0.047	0.984	0.325	0.042
SAF x Age 10-14	-0.035	0.057	-0.612	0.540	-0.030
SAF x Age 15	-0.022	0.037	-0.582	0.560	-0.019
SAF x Age 16-17	-0.004	0.048	-0.094	0.925	-0.003
SAF x Age 18-19	-0.033	0.065	-0.514	0.607	-0.022
SAF x Age 20-24	-0.127	0.081	-1.561	0.119	-0.123
SAF x Age 25-29	-0.147	0.084	-1.747	0.081	-0.142
SAF x Age 45-59	-0.190	0.062	-3.088**	0.002	-0.176
SAF x Age 60-64	-0.048	0.063	-0.755	0.451	-0.044
SAF x Age 65-74	-0.042	0.084	-0.497	0.619	-0.037
SAF x Age 75-84	-0.074	0.072	-1.027	0.305	-0.063
SAF x Age 85-89	0.041	0.065	0.635	0.526	0.035
SAF x Age 90 & Over	-0.104	0.049	-2.133*	0.033	-0.091
SAF x Male	-0.024	0.035	-0.680	0.497	-0.022
SAF x Mixed Ethnicity	-0.059	0.040	-1.503	0.133	-0.058
SAF x Asian Ethnicity	-0.082	0.070	-1.161	0.246	-0.090
SAF x Black Ethnicity	0.045	0.045	1.016	0.310	0.046
SAF x Other Ethnicity	0.022	0.038	0.567	0.571	0.022
SAF x European Country of Birth	0.017	0.037	0.458	0.647	0.019
SAF x Other Country of Birth	0.081	0.097	0.843	0.400	0.083
SAF x SES Class 1	-0.241	0.153	-1.573	0.116	-0.418
SAF x SES Class 2	-0.090	0.066	-1.365	0.173	-0.162
SAF x SES Class 3	-0.143	0.096	-1.489	0.137	-0.356
SAF x SES Students	-0.215	0.174	-1.234	0.218	-0.199
SAF x SES Group 8	-0.180	0.115	-1.564	0.118	-0.181
_cons	0.003	0.027	0.101	0.920	
R^2	0.280				
F	9.563				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

6.6.2 Overall

A MMR was undertaken introducing the latent self efficacy (SE) variable followed by a model with the interaction terms of SE with socio-demographic factor.

Adding the SE variable produced a significant regression equation($F(28,1289)=16.32$, $p<0.001$), with an adjusted R^2 of 0.2457.

Introducing the interaction terms yielded a decreased regression equation of $F(55,1262)=8.50$, $p<0.001$), with an adjusted R^2 of 0.2385 (See Table 6.13).

The calculated ΔR^2 was -0.007 and the factor was not deemed to be significant ($p=0.359$). Significant interactions did not occur with SE on any of the predictor variables. Based on this self efficacy is not deemed to be a moderator of socio-demographics on overall ambulance utilisation.

6.6.3 High acuity

A model was constructed for high acuity utilisation with SE and the interactions with socio-demographics. Introducing the interaction terms yielded a regression equation of ($F(55,1262)=7.80$, $p<0.001$), with an adjusted R^2 of 0.2212. No significant interactions occurred with socio-demographic variables (See Table 6.14).

As with overall utilisation the ΔR^2 was small at -0.008 and the SE factor was not deemed to be significant ($p=0.239$). Significant interactions did not occur with any predictor variables. Self efficacy is not deemed therefore to be a moderator of socio-demographics for high acuity ambulance utilisation.

6.6.4 Medium acuity

A model was constructed for medium acuity utilisation with SE and the interactions with socio-demographics. Introducing the interaction terms yielded a regression equation of ($F(55,1237)=7.60$, $p<0.001$), with an adjusted R^2 of 0.2194. Significant interactions occurred with SES classes 1,2,3 and SES group 8 (See

Table 6.13: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and self efficacy on overall Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Self Efficacy (SE)	-0.027	0.029	-0.918	0.359	-0.024
SE x Age 0-4	0.016	0.072	0.217	0.828	0.015
SE x Age 5-7	-0.010	0.057	-0.179	0.858	-0.009
SE x Age 8-9	0.013	0.044	0.288	0.773	0.013
SE x Age 10-14	0.022	0.054	0.398	0.690	0.022
SE x Age 15	-0.001	0.040	-0.027	0.979	-0.001
SE x Age 16-17	0.015	0.048	0.310	0.757	0.013
SE x Age 18-19	0.004	0.077	0.057	0.954	0.003
SE x Age 20-24	0.038	0.103	0.366	0.714	0.028
SE x Age 25-29	0.147	0.092	1.593	0.111	0.121
SE x Age 45-59	0.082	0.068	1.214	0.225	0.069
SE x Age 60-64	0.003	0.068	0.046	0.963	0.003
SE x Age 65-74	0.031	0.091	0.346	0.729	0.027
SE x Age 75-84	0.080	0.077	1.039	0.299	0.069
SE x Age 85-89	0.023	0.069	0.334	0.739	0.021
SE x Age 90 & Over	0.002	0.053	0.042	0.967	0.002
SE x Male	-0.011	0.045	-0.248	0.804	-0.008
SE x Mixed Ethnicity	0.042	0.041	1.030	0.303	0.041
SE x Asian Ethnicity	0.005	0.079	0.065	0.948	0.006
SE x Black Ethnicity	-0.006	0.047	-0.123	0.902	-0.005
SE x Other Ethnicity	-0.010	0.046	-0.224	0.823	-0.008
SE x European Country of Birth	-0.003	0.039	-0.084	0.933	-0.003
SE x Other Country of Birth	-0.015	0.117	-0.127	0.899	-0.014
SE x SES Class 1	-0.237	0.168	-1.412	0.158	-0.462
SE x SES Class 2	-0.100	0.072	-1.391	0.164	-0.170
SE x SES Class 3	-0.165	0.106	-1.552	0.121	-0.448
SE x SES Students	-0.220	0.189	-1.163	0.245	-0.167
SE x SES Group 8	-0.160	0.120	-1.334	0.182	-0.188
_cons	0.005	0.028	0.180	0.857	
R^2	0.270				
F	8.500				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

Table 6.14: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and self efficacy on high acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Self Efficacy (SE)	-0.034	0.029	-1.178	0.239	-0.031
SE x Age 0-4	-0.012	0.071	-0.172	0.864	-0.012
SE x Age 5-7	-0.022	0.056	-0.392	0.695	-0.020
SE x Age 8-9	0.002	0.043	0.048	0.961	0.002
SE x Age 10-14	-0.001	0.054	-0.018	0.985	-0.001
SE x Age 15	0.006	0.040	0.159	0.873	0.005
SE x Age 16-17	-0.021	0.048	-0.442	0.659	-0.018
SE x Age 18-19	0.005	0.076	0.061	0.952	0.004
SE x Age 20-24	-0.006	0.102	-0.063	0.950	-0.005
SE x Age 25-29	0.063	0.091	0.694	0.488	0.053
SE x Age 45-59	0.027	0.067	0.408	0.683	0.024
SE x Age 60-64	0.007	0.067	0.099	0.921	0.006
SE x Age 65-74	0.006	0.090	0.064	0.949	0.005
SE x Age 75-84	0.020	0.077	0.259	0.796	0.017
SE x Age 85-89	0.019	0.068	0.282	0.778	0.018
SE x Age 90 & Over	-0.004	0.052	-0.073	0.942	-0.004
SE x Male	-0.022	0.045	-0.497	0.619	-0.017
SE x Mixed Ethnicity	0.042	0.040	1.033	0.302	0.042
SE x Asian Ethnicity	-0.019	0.078	-0.249	0.803	-0.023
SE x Black Ethnicity	-0.012	0.047	-0.251	0.802	-0.011
SE x Other Ethnicity	-0.034	0.046	-0.750	0.453	-0.028
SE x European Country of Birth	-0.008	0.039	-0.204	0.838	-0.008
SE x Other Country of Birth	0.048	0.116	0.418	0.676	0.047
SE x SES Class 1	-0.298	0.166	-1.800	0.072	-0.595
SE x SES Class 2	-0.135	0.071	-1.911	0.056	-0.237
SE x SES Class 3	-0.198	0.105	-1.880	0.060	-0.549
SE x SES Students	-0.300	0.187	-1.606	0.109	-0.233
SE x SES Group 8	-0.192	0.118	-1.624	0.105	-0.231
_cons	0.011	0.028	0.394	0.694	
R^2	0.254				
F	7.803				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

Table 6.15). These were all negative β values suggesting that improved SE in a population decreases the impact of SES on ambulance utilisation.

However, the ΔR^2 was small at -0.003 and the SE factor was not deemed to be significant (p=0.572). Based on this low difference R^2 self efficacy is not deemed to be a moderator of socio-demographics for medium acuity ambulance utilisation.

6.6.5 Low acuity

A final model was constructed for low acuity utilisation with SE and its interaction with socio-demographics. Introducing the interaction terms yielded a regression equation of ($F(55,1262)=8.83$, $p<0.001$), with an adjusted R^2 of 0.2463. No significant interactions occurred with socio-demographic variables (See Table 6.16).

The ΔR^2 was -0.006 and the SE factor was not deemed to be significant (p=0.899). Significant interactions did not occur for any predictor variables. Self efficacy is not deemed therefore to be a moderator of socio-demographics for low acuity ambulance utilisation.

6.6.6 Summary

Self efficacy was not shown to significantly moderate ambulance utilisation in any of the acuity categories. Self efficacy is the most consistent factor in health behaviour theory. However, this has not been tested in the emergency ambulance setting and may indicate that it is less moderating when faced with a perceived crisis.

6.7 Moderation via access to services

The literature suggested that the inability to access services may lead to increased ambulance utilisation as an easy access option for a perceived health need. This

Table 6.15: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and self efficacy on medium acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Self Efficacy (SE)	-0.018	0.033	-0.566	0.572	-0.015
SE x Age 0-4	-0.045	0.080	-0.559	0.576	-0.039
SE x Age 5-7	-0.051	0.062	-0.813	0.417	-0.043
SE x Age 8-9	0.037	0.048	0.776	0.438	0.035
SE x Age 10-14	0.053	0.060	0.890	0.374	0.050
SE x Age 15	-0.043	0.045	-0.973	0.331	-0.034
SE x Age 16-17	0.028	0.053	0.526	0.599	0.022
SE x Age 18-19	0.026	0.085	0.302	0.763	0.018
SE x Age 20-24	0.020	0.113	0.175	0.861	0.014
SE x Age 25-29	0.166	0.103	1.613	0.107	0.126
SE x Age 45-59	0.050	0.075	0.662	0.508	0.039
SE x Age 60-64	-0.061	0.075	-0.814	0.416	-0.051
SE x Age 65-74	0.148	0.100	1.479	0.140	0.119
SE x Age 75-84	-0.012	0.086	-0.141	0.888	-0.010
SE x Age 85-89	0.028	0.075	0.375	0.708	0.024
SE x Age 90 & Over	0.004	0.058	0.075	0.940	0.004
SE x Male	-0.029	0.050	-0.574	0.566	-0.020
SE x Mixed Ethnicity	0.047	0.045	1.054	0.292	0.043
SE x Asian Ethnicity	0.032	0.087	0.371	0.711	0.035
SE x Black Ethnicity	0.011	0.052	0.207	0.836	0.009
SE x Other Ethnicity	-0.083	0.059	-1.406	0.160	-0.056
SE x European Country of Birth	-0.003	0.044	-0.060	0.952	-0.003
SE x Other Country of Birth	0.018	0.129	0.141	0.888	0.016
SE x SES Class 1	-0.375	0.185	-2.028*	0.043	-0.678
SE x SES Class 2	-0.158	0.079	-2.010*	0.045	-0.252
SE x SES Class 3	-0.246	0.117	-2.095*	0.036	-0.616
SE x SES Students	-0.394	0.208	-1.895	0.058	-0.278
SE x SES Group 8	-0.282	0.132	-2.142*	0.032	-0.310
_cons	0.022	0.031	0.708	0.479	
$\bar{R}^2$	0.253				
F	7.603				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

Table 6.16: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and self efficacy on low acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Self Efficacy (SE)	-0.003	0.027	-0.127	0.899	-0.003
SE x Age 0-4	0.042	0.067	0.626	0.531	0.042
SE x Age 5-7	0.018	0.052	0.352	0.725	0.018
SE x Age 8-9	0.005	0.040	0.134	0.893	0.006
SE x Age 10-14	0.001	0.050	0.028	0.978	0.002
SE x Age 15	0.002	0.037	0.042	0.966	0.001
SE x Age 16-17	0.026	0.045	0.577	0.564	0.024
SE x Age 18-19	-0.045	0.071	-0.636	0.525	-0.036
SE x Age 20-24	0.089	0.095	0.938	0.348	0.072
SE x Age 25-29	0.093	0.086	1.085	0.278	0.082
SE x Age 45-59	0.098	0.063	1.559	0.119	0.089
SE x Age 60-64	-0.027	0.063	-0.425	0.671	-0.026
SE x Age 65-74	0.008	0.084	0.097	0.923	0.008
SE x Age 75-84	0.105	0.072	1.463	0.144	0.096
SE x Age 85-89	0.036	0.064	0.563	0.574	0.035
SE x Age 90 & Over	-0.010	0.049	-0.197	0.844	-0.009
SE x Male	-0.021	0.042	-0.508	0.612	-0.017
SE x Mixed Ethnicity	0.026	0.038	0.691	0.490	0.028
SE x Asian Ethnicity	0.048	0.073	0.660	0.510	0.060
SE x Black Ethnicity	-0.007	0.044	-0.164	0.870	-0.007
SE x Other Ethnicity	-0.013	0.043	-0.309	0.757	-0.011
SE x European Country of Birth	-0.006	0.036	-0.154	0.878	-0.006
SE x Other Country of Birth	-0.070	0.108	-0.649	0.516	-0.072
SE x SES Class 1	-0.101	0.155	-0.647	0.517	-0.211
SE x SES Class 2	-0.053	0.066	-0.801	0.423	-0.098
SE x SES Class 3	-0.078	0.098	-0.792	0.429	-0.227
SE x SES Students	-0.057	0.175	-0.325	0.745	-0.046
SE x SES Group 8	-0.088	0.111	-0.797	0.426	-0.112
_cons	0.012	0.026	0.482	0.630	
R^2	0.278				
F	8.826				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

section tests the hypothesis that access to services by the population moderates socio-demographic factors on ambulance utilisation.

Access to services (ATS) was proposed as a latent variable constructed of travel time to hospital and GP practice by public transport or car, rating of quality of services, and opinion on ability to access local services (See Figure 6-4).

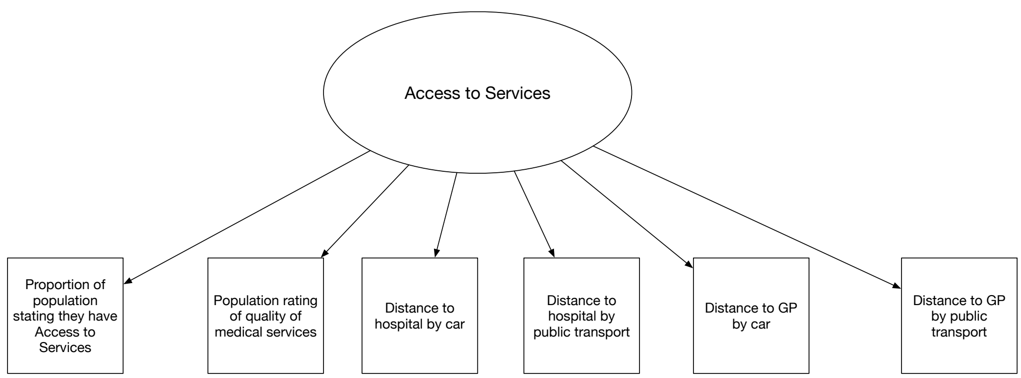

Figure 6-4: Access to services latent variables

6.7.1 Access to services confirmatory factor analysis

A CFA was constructed for the six proposed measures, this produced poor paths for the quality of medical services and ability to access services variables (<0.3). A second CFA was conducted excluding the two factors with poor paths. This second CFA had a reasonable Cronbach's alpha of 0.6408.

The four measures of travel time in minutes to GP and hospital by car and public transport were therefore used for the model testing.

6.7.2 Overall

A MMR was undertaken introducing the latent ATS variable, followed by ATS interactions with each of the socio-demographic factors.

Adding ATS and interactions produced a significant regression equation($F(55,3554)=23.66$, $p<0.001$), with an adjusted R^2 of 0.2567 (See Table 6.17).

The ΔR^2 was 0.008 and the factor was deemed to be significant ($p<0.001$). Significant interactions occurred for Age 65-74 (β=0.108), age 90 & over (β=0.060) and SES group 8 (β=0.144). Access to services was deemed therefore to be a moderator of socio-demographics on overall ambulance utilisation.

6.7.3 High acuity

A MMR was undertaken introducing the ATS variable and interaction terms with each of the socio-demographic variables.

Adding ATS and interactions produced a significant regression equation($F(55,3554)=21.58$, $p<0.001$), with an adjusted R^2 of 0.2387) (See Table 6.18).

The ΔR^2 was 0.009 and the factor was deemed to be significant ($p<0.001$). Significant interactions occurred for ages 65-74 (β=0.121) and 90 % over (β=0.059). Access to services was deemed therefore to be a moderator of socio-demographics on high acuity ambulance utilisation.

6.7.4 Medium acuity

A MMR was undertaken introducing the ATS variable and interaction terms with each of the socio-demographic variables.

Adding access to services and interactions produced a significant regression equation($F(55,3484)=21.77$, $p<0.001$), with an adjusted R^2 of 0.244) (See Table 6.19).

The ΔR^2 was 0.008 and the factor was deemed to be significant ($p<0.001$). Access to services was therefore deemed to be a moderator of medium acuity ambulance

Table 6.17: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and access to services on overall Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Access to Services (ATS)	-0.099	0.025	-3.989***	0.000	-0.089
ATS x Age 0-4	0.078	0.047	1.671	0.095	0.065
ATS x Age 5-7	0.031	0.031	1.007	0.314	0.027
ATS x Age 8-9	0.005	0.026	0.204	0.838	0.005
ATS x Age 10-14	0.007	0.034	0.210	0.833	0.006
ATS x Age 15	0.027	0.023	1.191	0.234	0.023
ATS x Age 16-17	-0.001	0.027	-0.053	0.958	-0.001
ATS x Age 18-19	0.067	0.042	1.595	0.111	0.054
ATS x Age 20-24	0.034	0.051	0.667	0.505	0.026
ATS x Age 25-29	-0.083	0.061	-1.363	0.173	-0.070
ATS x Age 45-59	0.062	0.042	1.461	0.144	0.058
ATS x Age 60-64	0.034	0.038	0.879	0.379	0.033
ATS x Age 65-74	0.119	0.051	2.323*	0.020	0.108
ATS x Age 75-84	-0.030	0.047	-0.629	0.530	-0.024
ATS x Age 85-89	-0.040	0.039	-1.036	0.300	-0.033
ATS x Age 90 & Over	0.071	0.030	2.367*	0.018	0.060
ATS x Male	-0.015	0.020	-0.738	0.460	-0.016
ATS x Mixed Ethnicity	0.027	0.036	0.747	0.455	0.023
ATS x Asian Ethnicity	0.048	0.054	0.888	0.375	0.043
ATS x Black Ethnicity	-0.040	0.046	-0.864	0.388	-0.031
ATS x Other Ethnicity	-0.010	0.040	-0.248	0.804	-0.007
ATS x European Country of Birth	0.026	0.029	0.904	0.366	0.022
ATS x Other Country of Birth	0.004	0.041	0.103	0.918	0.004
ATS x SES Class 1	0.159	0.098	1.622	0.105	0.247
ATS x SES Class 2	0.066	0.043	1.547	0.122	0.116
ATS x SES Class 3	0.105	0.062	1.704	0.088	0.250
ATS x SES Students	0.120	0.117	1.023	0.306	0.085
ATS x SES Group 8	0.166	0.072	2.301*	0.021	0.144
_cons	-0.060	0.021	-2.886**	0.004	
R^2	0.268				
F	23.658				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

Table 6.18: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and access to services on high acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Access to Services (ATS)	-0.113	0.025	-4.565***	0.000	-0.104
ATS x Age 0-4	0.070	0.046	1.512	0.131	0.060
ATS x Age 5-7	0.036	0.031	1.158	0.247	0.031
ATS x Age 8-9	-0.000	0.026	-0.011	0.991	-0.000
ATS x Age 10-14	0.016	0.034	0.464	0.642	0.013
ATS x Age 15	0.026	0.022	1.173	0.241	0.023
ATS x Age 16-17	-0.015	0.027	-0.556	0.578	-0.013
ATS x Age 18-19	0.068	0.041	1.646	0.100	0.056
ATS x Age 20-24	0.075	0.050	1.487	0.137	0.060
ATS x Age 25-29	-0.084	0.060	-1.397	0.163	-0.073
ATS x Age 45-59	0.060	0.042	1.428	0.153	0.058
ATS x Age 60-64	0.034	0.038	0.887	0.375	0.034
ATS x Age 65-74	0.130	0.051	2.567*	0.010	0.121
ATS x Age 75-84	-0.040	0.047	-0.856	0.392	-0.034
ATS x Age 85-90	-0.051	0.038	-1.341	0.180	-0.044
ATS x Age 90 & Over	0.069	0.030	2.311*	0.021	0.059
ATS x Male	-0.029	0.020	-1.435	0.151	-0.031
ATS x Mixed Ethnicity	0.050	0.036	1.411	0.158	0.044
ATS x Asian Ethnicity	0.030	0.053	0.573	0.567	0.028
ATS x Black Ethnicity	-0.061	0.045	-1.339	0.181	-0.049
ATS x Other Ethnicity	0.020	0.040	0.513	0.608	0.015
ATS x European Country of Birth	0.021	0.028	0.737	0.461	0.018
ATS x Other Country of Birth	0.000	0.040	0.008	0.993	0.000
ATS x SES Class 1	0.074	0.097	0.764	0.445	0.118
ATS x SES Class 2	0.041	0.042	0.974	0.330	0.074
ATS x SES Class 3	0.055	0.061	0.899	0.369	0.133
ATS x SES Students	-0.005	0.116	-0.040	0.968	-0.003
ATS x SES Group 8	0.123	0.071	1.721	0.085	0.109
_cons	-0.053	0.020	-2.604**	0.009	
R^2	0.250				
F	21.579				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

Table 6.19: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and access to services on medium acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Access to Services (ATS)	-0.108	0.026	-4.064***	0.000	-0.093
ATS x Age 0-4	0.087	0.050	1.742	0.082	0.069
ATS x Age 5-7	0.028	0.033	0.856	0.392	0.023
ATS x Age 8-9	-0.012	0.028	-0.430	0.667	-0.010
ATS x Age 10-14	0.030	0.036	0.822	0.411	0.024
ATS x Age 15	0.022	0.024	0.924	0.356	0.018
ATS x Age 16-17	-0.012	0.028	-0.411	0.681	-0.009
ATS x Age 18-19	0.038	0.044	0.860	0.390	0.030
ATS x Age 20-24	-0.013	0.054	-0.241	0.809	-0.010
ATS x Age 25-29	-0.091	0.065	-1.401	0.161	-0.073
ATS x Age 45-59	0.070	0.045	1.560	0.119	0.063
ATS x Age 60-64	0.009	0.041	0.211	0.833	0.008
ATS x Age 65-74	0.076	0.055	1.398	0.162	0.066
ATS x Age 75-84	-0.036	0.050	-0.726	0.468	-0.029
ATS x Age 85-89	-0.015	0.041	-0.363	0.717	-0.012
ATS x Age 90 & Over	0.039	0.032	1.231	0.218	0.032
ATS x Male	-0.024	0.022	-1.128	0.260	-0.025
ATS x Mixed Ethnicity	-0.033	0.038	-0.862	0.389	-0.027
ATS x Asian Ethnicity	0.081	0.057	1.421	0.155	0.071
ATS x Black Ethnicity	-0.009	0.049	-0.178	0.859	-0.007
ATS x Other Ethnicity	-0.021	0.042	-0.492	0.623	-0.014
ATS x European Country of Birth	0.059	0.031	1.928	0.054	0.048
ATS x Other Country of Birth	0.007	0.043	0.170	0.865	0.007
ATS x SES Class 1	0.067	0.104	0.644	0.520	0.100
ATS x SES Class 2	0.044	0.045	0.959	0.338	0.073
ATS x SES Class 3	0.056	0.065	0.861	0.389	0.128
ATS x SES Students	0.055	0.124	0.442	0.658	0.038
ATS x SES Group 8	0.077	0.077	1.010	0.313	0.065
_cons	-0.041	0.022	-1.880	0.060	
R^2	0.256				
F	21.767				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

utilisation based on the R^2 difference. However, non of the interactions with socio-demographics were showing a significant β.

6.7.5 Low acuity

A final MMR was undertaken introducing the ATS variable and interaction terms with each of the socio-demographic variables.

Adding ATS and interactions produced a significant regression equation($F(55,3554)=24.01$, $p<0.001$), with an adjusted R^2 of 0.2596 (See Table 6.20).

The ΔR^2 was 0.004 and the factor was deemed to be significant ($p<0.001$). Significant interactions occurred for ages 90 & over (β=0.058) and SES group 8 (β=0.151). Access to services was therefore deemed to be a moderator of socio-demographics on low acuity ambulance utilisation.

6.7.6 Summary

Access to services (now determined by standardised travel time to nearest GP and hospital by car and public transport) had a significant moderation effect on social-demographics with ambulance utilisation. This was effect was greatest in the high acuity utilisation category.

6.8 Data linkage summary

Sections 4.10.2 and 4.2.3 within the methodology outlined how the databases would be connected using geographical identifiers.

Figure 6-5 shows the connection of the four datasets for each of the analyses undertaken. It identifies the number of LSOA, population and emergency calls that were available for each analysis. As understanding society is a household survey this had a much smaller sample than the census, which aims to have complete coverage of the population.

Table 6.20: Results of moderated multiple regression analysis of the relationships between socio-demographic factors by LSOA population proportion (Gender, Age, Country of Birth, Ethnicity & SES) and access to services on low acuity Ambulance utilisation per 1000 population

	Coef.	Std. Err.	t	P>|t|	Beta
Access to Services (ATS)	-0.084	0.023	-3.604***	0.000	-0.081
ATS x Age 0-4	0.030	0.044	0.694	0.488	0.027
ATS x Age 5-7	0.030	0.029	1.014	0.310	0.027
ATS x Age 8-9	-0.008	0.025	-0.310	0.756	-0.007
ATS x Age 10-14	-0.013	0.032	-0.424	0.671	-0.012
ATS x Age 15	0.018	0.021	0.862	0.388	0.017
ATS x Age 16-17	0.009	0.025	0.343	0.732	0.008
ATS x Age 18-19	0.044	0.039	1.126	0.260	0.038
ATS x Age 20-24	0.028	0.047	0.590	0.555	0.023
ATS x Age 25-29	-0.087	0.057	-1.545	0.123	-0.079
ATS x Age 45-59	0.011	0.039	0.291	0.771	0.012
ATS x Age 60-64	0.025	0.036	0.701	0.484	0.026
ATS x Age 65-74	0.077	0.048	1.610	0.108	0.075
ATS x Age 75-84	-0.047	0.044	-1.079	0.281	-0.042
ATS x Age 85-89	-0.058	0.036	-1.599	0.110	-0.052
ATS x Age 90 & Over	0.064	0.028	2.283*	0.023	0.058
ATS x Male	-0.021	0.019	-1.111	0.267	-0.024
ATS x Mixed Ethnicity	0.025	0.034	0.737	0.461	0.023
ATS x Asian Ethnicity	0.050	0.050	1.003	0.316	0.049
ATS x Black Ethnicity	-0.026	0.043	-0.598	0.550	-0.022
ATS x Other Ethnicity	-0.015	0.037	-0.393	0.694	-0.011
ATS x European Country of Birth	0.003	0.027	0.127	0.899	0.003
ATS x Other Country of Birth	-0.000	0.038	-0.003	0.997	-0.000
ATS x SES Class 1	0.161	0.091	1.766	0.078	0.268
ATS x SES Class 2	0.056	0.040	1.404	0.160	0.105
ATS x SES Class 3	0.102	0.058	1.780	0.075	0.260
ATS x SES Students	0.117	0.109	1.074	0.283	0.090
ATS x SES Group 8	0.162	0.067	2.410*	0.016	0.151
_cons	-0.020	0.019	-1.045	0.296	
R^2	0.271				
F	24.005				
p	0.000				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Comparators: Proportion of population as Female, Age 30-45, White Ethnicity & UK Country of Birth

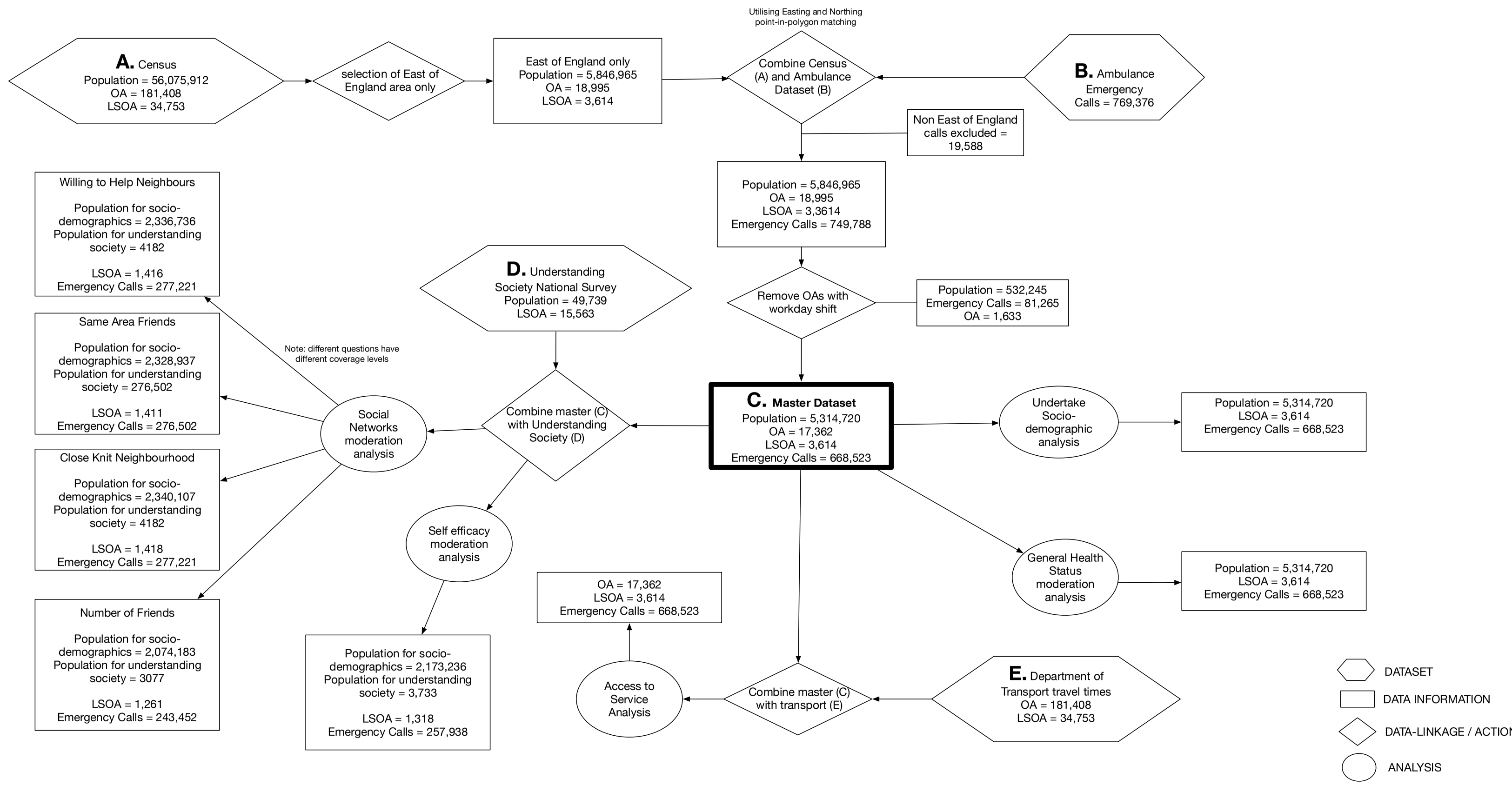

Figure 6-5: Effect of linkage of Census, Ambulance utilisation, Travel time and Understanding Society datasets on population, emergency calls and LSOAs included in analysis

6.9 Summary

In summary the population socio-demographics fit a model which explains 25% of the variation in ambulance utilisation, and is in line with the underpinning theory. It identifies that there is some variation between the acuity levels. The factors that are able to moderate the socio-demographic variation are general health status and access to services. Self efficacy and social networks were not found to be significant moderators.

Chapter 7

Discussion

This chapter analyses the findings in relation to the previous literature and the theoretical framework. It identifies where the findings match, and where they do not explores reasons why this may be the case.

7.1 Pre-disposing factors

7.1.1 Age

The theory proposed that socio-demographics would be related to variation in ambulance utilisation. The data fits this model with socio-demographics predicting 24% of variation. The correlation analysis supported the proposition that older people would be correlated with positively with utilisation. The positive relationship of age with utilisation starts at the 65-74 age group and correlation strength increases with each age group (Zakariassen et al. 2010, Rucker et al. 1997, Svenson 2000, Young et al. 2003, McConnel 1998). The literature outlined that those less than four years of age may have increased utilisation (van Charante et al. 2007). The results from this study found this not to be the case in correlation and regression analysis. This may be related to the fact that those areas with a high number of children also have a high number of middle-age adults which had less utilisation, therefore compensating the effect. Young adult-hood was also proposed to be attributed with utilisation in England (Department of Health 2009). This age group was not identified as correlated with utilisation, but the SES class of students was.

7.1.2 Gender

The literature outlined a mixed view on the suggested effect of gender on ambulance utilisation (Kawakami et al. 2007, Adamson et al. 2003). The results from this study found that populations with a higher proportion of females had a positive relationship with utilisation compared with a negative relationship for males. This supports the theory that males exhibit less help seeking behaviours compared with females, and this was most noticeable in the low acuity category (Glanz & Rimer 2008). This is an important finding in the context of health prevention, as early clinical intervention for some emergency conditions, such as stroke and myocardial infarction is related to improved outcomes (Caroline et al. 2011).

7.1.3 Ethnicity

Ethnicity is recognised as a factor in the ITMDEHS, however, the literature is less clear of its impact on utilisation (Siler 1975, Aldrich et al. 1971, McConnel & Wilson 1999, Rucker et al. 1997). This study found that all non-white ethnic groups were positively correlated with utilisation and this relationship was strongest in the high acuity utilisation category. Within the regression analysis however, mixed and black ethnicity were significantly explaining increased utilisation whilst asian and other ethnicity decreased. The impact of ethnicity on utilisation rate could be related to known higher clinical needs due to increased prevalence of some conditions, although this would also apply to the asian group (Balarajan 1991). The health beliefs may be variable in different ethnic groups but this was not tested within the model.

7.1.4 Country of birth

Country of birth was explored as a factor that has not previously been found in the literature related to ambulance utilisation. It is unclear what impact country of birth would have on level of need once living in the UK. However, cultural beliefs are linked in the theoretical models to behaviours and these may be determined by upbringing in other countries. The correlation analysis found that non UK country of birth had a positive association with utilisation. However, in the regression analysis only European country of birth was shown to be significant in predicting utilisation. The limited three categories used in this study may need to be explored further to reach inference about these results. Also the variable does not recognise how long they were in another country, just that they were born there.

7.1.5 Socio-economic status

SES within the correlation analysis showed a significant pattern in line with the theory of decreased SES resulting in a positive relationship with ambulance utilisation. SES groups 1 to 3 had a negative relationship with utilisation. Groups 4 and above had a positive relationship with utilisation and the strength increased for each group. The theory and previous studies showed that employment status and deprivation were related to increased utilisation (Peacock & Peacock 2006). SES group 8, the long term unemployed was apparent in a number of the models as a significant predictor of utilisation.

7.2 Moderating factors

7.2.1 General health status moderation

General health status was found to be a moderator of socio-demographics on ambulance utilisation in all categories of acuity, but greatest for low acuity. Health status was recognised within the ITMDEHS and also links to the concept of need driving utilisation (Gulliford & Morgan 2003). This study supports the important impact of population health status and outlines that it may have a 3% impact on moderating utilisation overall. The CQS for general health status did have a comparably low agreement score. However, the majority of the population rated themselves as fair or above. When the categories are combined into good with very good and bad with very bad agreement rate improved to 87.5%.

7.2.2 Social networks moderation

Each of the four measures (close knit neighbourhoods, willingness to help neighbours, number of friends and local friendships) proposed for social networks did not demonstrate moderation of socio-demographics on ambulance utilisation in this analysis. This finding is not in line with the theoretical framework. Moderation of social networks has not been tested for ambulance utilisation previously, so there are not previous studies to compare to. In the emergency setting it is possible that social networks do play a major moderation role. Whilst there is a known benefit to health and illness behaviour from having a close social network, the mechanism of this is not clear. In urgent situations it is suggested that the only option may be to call ambulance (Alonzo 1980). In this case moderation might be more likely for low acuity calls, where a close social network could support accessing other options, but this was not found to be the case either in the analysis. Another possibility for not finding an effect is due to measurement error. The four concepts were constructed from rationale about the group of behaviours that would support a close social network. However, these may not reliably test for the concept of social networks which is wide ranging. The methodology also utilised the concept of homogeneity within an LSOA and that those completing the understanding society survey as being representative of their LSOA population.

7.2.3 Self efficacy moderation

Self efficacy was the factor that is most common across the theories (Conner & Norman 2015). Within this study however, self efficacy was not found to be a moderator for any of the acuity categories. Self efficacy moderating is grounded in social cognition theory which outlines the concept that behaviour is regulated by forethought. Research has shown that those with high self efficacy perceive troubles as challenges and this is widely linked to the ability to enact decisions. The hypothesis therefore being that self efficacy would play a role in regulating ambulance utilisation. The findings suggest that self efficacy may not be as powerful as the theory suggests in this setting. As with social networks error may also occur in reaching the conclusion. A sample was used for reaching the self efficacy of each LSOA, and the GES utilised. The concept of self efficacy could be considered to be context specific and therefore the generation of an emergency tool may be appropriate for further research.

7.2.4 Access to services moderation

Access to services links with the social barriers explanations of behaviour which include the availability, proximity and costs of actions taken. As the two indicators for quality and accessibility were dropped from the analysis the final measure used is an indicator of proximity of services by time. The study found that it was a significant moderator of socio-demographics on ambulance utilisation and the effect was greatest for high acuity utilisation (0.9%). There was less impact for low acuity at only 0.4%. The reasoned action attributes of the theory suggest that decisions are made by considering the options. In the case of high acuity conditions, the ability to get to the hospital quickly may be considered important. Proximity of ED is an important access factor and in most cases patients have not consulted primary care first (Campbell 1994).

7.3 Remaining variation

The model with general health status interactions was able to explain 30% of ambulance utilisation, which is within the range stated for models based on reasoned actions (Conner & Norman 2015). Considering the theoretical framework other elements that might account for the remaining variation include:

- un-measured socio-demographics (i.e. homelessness, martial status)
- Health beliefs
- Perceived acuteness
- Perceived costs and benefits of options

Disaggregating the groups may yield an improvement in predictability. For example greater options on country of birth, or different age categories.

7.4 Theory development

This study has been underpinned by health behaviour theory. The ITMDEHS was recognised as the most recently developed model focussing specifically on bringing together previous theory in relation to emergency service utilisation. The theoretical model identifies a range of factors proposed to be related to utilisation levels:

- Socio-demographics
- Self efficacy
- Social and Network Support
- General Health Status
- Health Beliefs and Preferences
- Perceived Acuteness
- Perceived Costs and Benefits
- Cues to Action

The model groups together ambulance utilisation with wider emergency service use such as emergency department attendance, so is not a population level model of ambulance utilisation. This study has specifically considered relevant component parts at population level including the addition of access to services as a moderator. The study supported that socio-demographics influence utilisation levels. The results concur that general health status acts as a moderator and also access to services which should be added as a moderator. It did not support self efficacy or social networks as significant moderators. Whilst there are a large number of studies developing health behaviour theory these are primarily found outside the emergency context. Considering the ambulance service context this study therefore contributes to the development of a model for population ambulance service utilisation. Importantly this should consider explaining how populations utilise the service for varying acuity levels.

In this study it was assumed that all four factors were moderators. It is possible that some may be acting as mediators.

7.5 Methodology review

Studying human populations in their natural habitat is known to be difficult with a range of methodological issues. It is proposed that studies are undertaken which are feasible rather than those which are most capable of answering unresolved questions (Cochran 1963). This was the case for this study which utilised the available methodology of ecological correlation of large population data sources.

This section reviews the datasets and methods used in considering practical health research.

7.5.1 The datasets

7.5.1.1 Ambulance

The advantage of the ambulance dataset is that it covers the whole population and includes consistent determinants of acuity using an internationally audited system (AMPDS). It also includes all emergency calls for those conveyed and not-conveyed to hospital, this is a benefit over previous studies which have undertaken surveys once the patient arrives in ED. The major limitation of the ambulance dataset used is that it is location rather than patient centric. This was attempted to be mitigated for by the workday population removal. However, a number of patients will still have been in the wrong geography for ecological correlation. With increasing use of electronic collection of demographics from patients a future study could use ecological correlation on home address rather than address of the emergency call.

7.5.1.2 Census

The census was an appropriate dataset and the ecological correlation that was undertaken at LSOA level was in-line with previous studies. The major advantage of the census is population coverage and quality. The limitation is that it is only carried out every 10 years and is based on where you live. Although there is a developing workday population dataset that could be utilised, which is increasingly problematic in rapidly changing health behaviours, such as the increase in ambulance utilisation. The census utilised in this study as available was based on the home address. There is however the development of alternative population series in development for short-term residents, workday and workplace populations. This would still require the ambulance dataset to recognise place of call to do the matching, although accuracy could potentially be increased by assuming that working age people are at their place of work rather than home during normal working hours.

7.5.1.3 Understanding Society

Understanding Society is the largest survey of it's kind and contains a significant number of variables. Like the census it has rigorous quality checking reducing sample errors. It is also undertaken face-to-face which increases response validity. US covers a significant number of individuals, 40,000 across the UK and 4182 used in this study. This is a significant sample size with a 1.99 confidence interval at the 99% level. However, the limitation is that when they are analysed at lower geographic levels, although there is good coverage of the LSOAs the number of participants in each area is small. This study has utilised the fact that LSOAs are designed to be similar to interpret the results. US has over a 1,000 variables related to society. A future study could use these in an Exploratory Factor Analysis to determine if the theoretical base is missing significant variables.

7.5.1.4 Travel times

The travel times dataset provided a useful indicator of access to services. It benefits from having complete coverage of the geography but is limited by not modelling different times of day.

7.5.2 Quantitative analysis

This study approached the question from the positivist paradigm and used quantitative methodology. To develop further the understanding of behaviour in relation to ambulance utilisation, not only do the factors need to be identified but an understanding of why they may influence (causality). A broader research question could therefore be considered such as 'what are the factors that determine variation in ambulance utilisation and **why** do these factors alter behaviour'. This broader question was considered early in the development of the study as not only being identification of the factors associated with usage and exploring reasons in relation to the literature, but also expanding into building knowledge on why in relation to behaviour. An appropriate approach for this would have been mixed methodology. This is an emerging research design which utilises the qualities of both quantitative and qualitative methods to answer the question. Mixed methods can be used to merge, connect or embed data (Creswell & Plano Clark 2007). It is a combination of collecting, analyzing and importantly "mixing" both quantitative and qualitative data within studies to answer questions more fully (Creswell & Plano Clark 2007, Tabachnick & Fidell 2013). The rationale for using mixed design is that using a single methodology would not be sufficient to capture the full details of the situation, this is highly likely in health behaviour research. This broader research question would lend itself towards a mixed methods approach underpinned by the philosophical assumptions of pragmatism. This study adequately answered the question it set out from a quantitative approach

(Ivankova et al. 2006). To develop the study further the findings in relation to socio-demographic and moderating factors could be used in a mixed methods study developing understanding of why the factors alter behaviour. This process would be a sequential explanatory design (See Figure 7-1), with this completed study acting as phase 1 (Creswell & Plano Clark 2007, Tabachnick & Fidell 2013, Ivankova et al. 2006).

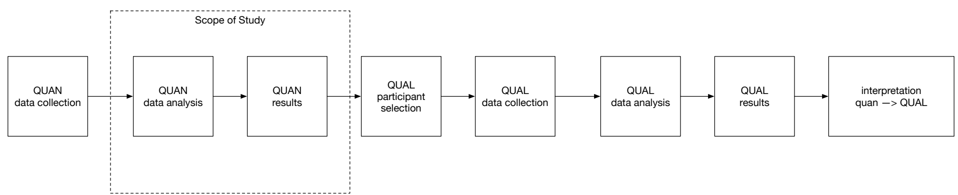

Figure 7-1: Sequential explanatory design
(Creswell & Plano Clark 2007)

7.5.3 Big data

This study has utilised large datasets and conducted secondary data analysis. This approach falls within the emerging big data movement. There is not a rigorous definition of 'big data', but the concept originally emerged from having large amounts of data beyond traditional computational processing ability (Mayer-Schonberger & Cukier 2013). With the improvements over time in technology and the associated computing power this approach is increasingly feasible within research on standard computers. The increasing ability to store large information in centralised remote servers, known as the cloud, has also improved opportunities for using big data.

Within this study the SQL database created was 8,094 MB big, with 110 tables and 11,935,300 rows of data. This was still easily utilised on a standard computer. The large data used within this study was from four datasets and made accessible for analysis by combining on a common matching field, the LSOA.

The big data concept is fundamentally about understanding relationships across a large amount of information. Within academic research, but also the commercial setting, this data is likely to have been generated for another primary purpose e.g. photo location, search history or product sales. It is then used for another purpose to answer a research question, such as behaviour insight. For example, the use of location data from search terms on the internet related to 'flu' have been shown to correlate with areas of flu virus prevalence, and provide a faster and larger output than traditional sample analysis from patients (Marr 2015). The advantage of the big data approach for research, but also operational management is access to complete populations and usually high quality data (Mayer-Schonberger & Cukier 2013). As with this study, it is particularly advantageous in emergency service research due to the ethical issues that arise from primary data collection in the emergency setting (Wong et al. 2015). The data visualisation concept is also a key component of the big data method. Within this study the use of GIS gave an opportunity to see geographical patterns of population distribution, which would be more difficult to assess with tabular data, especially across 3,614 LSOAs.

When using big data there are some concepts to be considered which differ from traditional research methods. Three shifts in thinking are encouraged by Mayer-Schonberger & Cukier (2013):

- Analysis of larger data about a topic rather than a small sample
- Embrace the messiness of data
- Respect correlations rather than causality

Within this study these concepts evolved throughout the research experience.

7.5.3.1 Large data

Access to the whole of the Understanding Society questionnaire and complete Census data were potentially available for use in this study. However, only the fields related to the theoretical base were utilised in the analysis based on the traditional research advice of theory developing the research questions and therefore dataset (Coolican 2009). However, within the big data movement there is encouragement to include all available data to get the best out, regardless of underpinning theory. For example in this study relationships could have been considered between ambulance utilisation and all census or understanding society variables, not just those suggested by the theory. This could have included central heating in houses, parenting style, job satisfaction or charitable giving. Future research could take this big data approach of looking for relationships across the complete data.

7.5.3.2 Data messiness

Within this study initial analysis of the data was undertaken in the traditional way. This included considering the outliers as identified in section 6.2. Due to the large amount of data, and the 'messiness', to exclude all of these would have significantly reduced the sample size. To analyse each outlier data point across a large data set would have been time intensive and impractical. Therefore all data was included in the study, embracing the messiness concept outlined. Within big data the concepts of not restricting data use and more data trumping better data, are a shift in traditional quantitative research thinking, where the quality of the data has primacy.

7.5.3.3 Respecting correlations

This study has outlined based on the theory why population characteristics may relate to behaviour, seeking to identify causality. However, the big data movement encourages shifting from this and respecting that the correlation exists regardless of understanding cause. Increasingly this use of identified correlations in the commercial sector is used to change practice, without having to necessarily understand why. Using this in practice within health settings requires a shift in thinking, for example had a correlation been shown between ambulance utilisation and living in proximity to a supermarket, but no underpinning of theory of why this was the case, would it be appropriate to change practice?

Marr (2015) advocates the SMART model for using big data:

- Start with Strategy
- Measure metrics and data
- Analyse your data
- Report Your results
- Transform your business and decision making

In the case of this study it was started with strategy, considering the increasing utilisation of emergency services, and the potential policy options to change this. Large data was then used and Chapter 8 outlines the potential policy and practice implications from the results. Big data is not infallible as a method, but used with strategy it can provide insights. The increasing availability of large data makes this accessible for research and provides insights not available through traditional sampling methods. Social research, such as understanding health utilisation behaviours, can lend itself to big data methodology. Within this study large datasets were used, but fundamentally the census and understanding society were still based on survey instrumentation. It has been suggested that sample surveying and in-depth interviews are increasingly out-dated and are less secure at accurately assessing the population due to the limited sample, people moving and honesty (Savage & Burrows 2007).

The ambulance and travel time datasets provided complete population coverage in this study. However the census and understanding society were based on surveys, and understanding society a limited sample size. Finding accessible data collected from daily activities could be a further way to improve this study and gain further insight. For example using data, such as twitter, gives dynamic, real-time, over-time information of what the population actually does, not what they tell you within surveys (Tinati et al. 2014). The notion of social networks was explored in this study using a range of questions from the understanding society survey. Utilising big data now available from social media could give access to a much wider cohort, and greater insight to the relationship between ambulance utilisation and social network behaviour.

7.5.3.4 Challenges

Big data is promising for social research but also provides some challenges. The ethnical issues of utilising this approach need to be considered, and because of complete population coverage may require a wide conversation with the public. For example would the public support the use of real-time data available about then, i.e. trends on social media to effect the triage, access and response to an emergency ambulance call?

7.5.3.5 Summary

In summary, the use of large data sets is an expanding area of research and the ESRC have established a secondary data analysis initiative to support. It is particularly advantageous in emergency service research where primary data collection can be difficult as well as social research areas where whole population information can provide insight. Whilst with big data you are limited to that which already exists this study has demonstrated that it is possible to use ecological correlation to develop and explore understanding of utilisation behaviour. The ethical issues of applying this approach in practice warrant discussion within society.

7.5.4 Ecological correlation

This study has utilised ecological correlation. This method has come under previous criticism due to the ecological fallacy. However, if reported at population level and not linked to causation it can provide a useful tool especially in the emergency setting. To collect data in an alternative way is time consuming, and difficult compared to the ecological correlation approach.

7.5.5 Moderated Multiple Regression

MMR was a suitable statistical tool to achieve the aims of this project in considering each moderator separately. It suffers from issues with multi-collinearity and interaction of factors. In developing the model further SEM would be an advantageous approach.

7.5.6 Applying the method in practice

The methodology outlined in this study of correlating large datasets could be built into a live information system for ambulance services and more broadly health and social care services. In doing so on a live basis situational awareness of the utilisation of emergency services could be achieved compared with other datasets. This method has become widely used in the commercial sector to monitor and alter consumer spending (Humby et al. 2003). Achieving the same for the health services could allow timely interventions. In healthcare settings based on insurance systems this is a more widely used actuarial approach to achieve understanding of population risk of service utilisation, and therefore associated premium levels.

7.6 Summary

This chapter has explored how the results from the study relate to the theoretical framework and previous literature. It has identified that broadly the sociodemographics match previous studies and that general health status and access to service moderate in line with the theory. It has explored why self efficacy and social networks did not moderate in this study, either because the theory is wrong or due to methodological issues. Consideration has been given to the implication for theory development in line with deductive research practice of creating hypotheses based on theory and testing with data (Robson 2002).

Chapter 8

Implications for policy & practice

8.1 Introduction

The previous chapters have identified the socio-demographic factors related to ambulance utilisation and tested a model with the moderating impact of general health status, self efficacy, social networks and access to services. The results identify that populations containing a higher proportion of older people, lower socio-economic status groups, non white ethnicity and non UK country of birth are related to ambulance utilisation. Improved general health status and closer access to services were found to significantly moderate socio-demographics on ambulance utilisation. However, self efficacy and social networks were not found to moderate in contrast to the theoretical framework.

This research was framed in the context of the desire to understand variation in ambulance utilisation and in doing so identify any potential impact on demand management opportunities for health services in England (Department of Health 2004, Association of Ambulance Chief Executives 2011, Department of Health 2005*b*).

This chapter explores what the policy and practice implications of the findings may be for demand management. Specifically it will explore how the findings from the research could be used to target health behaviour interventions and also how the findings could be applied to future service design.

8.1.1 Revisiting the triple aim

At the outset of the study it was identified that the triple aim was proposed as an international conceptual goal for healthcare systems (Berwick et al. 2008). It implied that healthcare systems are established to meet their population needs and that this requires a structure of services that identifies the population and deploys services that can meet their need (Tulchinsky & Varavikova 2014). Equally the triple aim establishes the need to meet a low per capita cost which requires consideration of the most effective design to achieve the patient outcome and population health aims. The increasing ambulance utilisation, disproportionate to population growth requires consideration of the displayed population behaviours as an opportunity to manage demand. Exploration is required of the interventions that could be taken by health system policy makers to meet the triple aim. A key part of this can be considering population characteristics and factors associated with utilisation.

8.1.2 Potential policy interventions

In the context of the research findings consideration is given to where policy and practice interventions could be made. The variables used in this research could be broadly categorised into modifiable and unmodifiable factors. Modifiable factors being those which could be changed by appropriate intervention (e.g. improving social networks). Whereas unmodifiable are those that are fixed (e.g. age) and cannot be changed but could necessitate a different service model (See Table 8.1).

Table 8.1: Modifiable factor analysis

Factor	Category	Rationale
Gender	Un-modifiable	Fixed variable
Age	Un-modifiable	Fixed variable
Ethnicity	Un-modifiable	Fixed variable
Country of birth	Un-modifiable	Fixed variable
Social-economic status	Semi-modifiable	Improving economic opportunity is dependent on multiple conditions
General health status	Modifiable	Improving population health is possible
Self efficacy	Modifiable	Known interventions available to improve self efficacy
Social networks	Modifiable	Interventions could occur to improve social cohesion
Access to services	Semi-modifiable	Improvement possible of existing services, but ability to actually move services and decrease distance may be limited

In constructing policy the modifiable factors act as a potential opportunity to effect behavioural change. In reaching health policy recommendations consideration should be given to the cost of any intervention in comparison to the likely impact. The development of a model as constructed in this study can support this approach. For example if improving social networks has a measurable impact on moderating utilisation and it is possible to calculate the cost of developing such a network, i.e. introducing support groups, then an economic analysis could be undertaken based on the current ambulance call cost of c£275 vs the cost of the intervention (Morris et al. 2007). As well as the core ambulance costs an analysis should consider secondary costs, as if the utilisation moves from ambulance calls to self management not only may primary costs be saved but potential hospital or other service tariffs (See Table 8.2).

Table 8.2: NHS indicative service costs

Service	Indicative Cost per use (£)
Ambulance	247
A&E attendance	124
Average Hospital Tariff	1554
GP appointment	32
NHS 111 call	16
Using NHS choices website	0.46

Alongside considering empirical evidence and economic analysis policy makers will also have to make reasoned judgements in relation to political, ethical and moral views of the society in which it is operating (Moore 2012).

Identifying interventions related to modifiable factors could be considered through the health behaviour frameworks (Conner & Norman 2015).

For those characteristics that are considered non-modifiable then the possible policy option is to consider how services could be designed to meet the varying specific needs of the population.

8.2 Previous approaches to changing ambulance utilisation behaviour

In ambulance service reports, policy statements, the media and previous research studies the desired outcome of decreasing demand is widely cited (NHS England 2014*a*). As previous studies have identified factors correlated with perceived 'inappropriate use' the commonly drawn recommendation is an increased requirement for public education to achieve decrease in demand (Morris & Cross 1980). This approach of recommending generalised public education makes the potential assumption that individuals are making rational choices in the moment of crisis/health need as proposed in the theory of reasoned action and behaviour (Ajzen & Madden 1986).

An example of this general approach is outlined through a media campaign which focussed on the phrases ‘You wouldn’t call the fire service to blow out a candle’ and ‘You wouldn’t call the coastguard if you fell in a puddle’ (See Figures 8-1 & 8-2)

Figure 8-1: Ambulance demand reduction media campaign - candle

This campaign presumably focused on the hypothesis that the service is being used inappropriately. The perceived solution therefore is a media campaign highlighting this to the service users. However, to be effective this would require recognition from the target audience that it applied to them, and that they were then making a rational choice at the time of need. In the context of an emergency this may not be the case (Derlet & Ledesma 1999).

It is not known what effect the campaign highlighted has had in England. However, demand for ambulance services continues to increase yearly despite a range of these general media campaigns. A study in Japan following a public awareness campaign concluded that both serious and non-serious calls reduced during the campaign (Ohshige 2008). This highlights the potential problem of focussing behaviour change interventions without having linked to an understanding of the target population and the factors involved in their decision making (Glanz & Rimer 2008).

Figure 8-2: Ambulance demand reduction media campaign - puddle

In summary 'public education' is a common conclusion from studies into ambulance utilisation to generate a decrease in demand. This conclusion simplifies the understanding of health behaviour, decision making and moderating factors.

8.3 Alternative approaches

There are a number of alternative approaches that could be considered to the general public health campaign. These should be based in behaviour change theories and for this study should reflect the areas identified in the model as related to ambulance utilisation.

8.3.1 Targeted campaigns

The traditional approach to campaigns appears to have focussed on an underlying assumption that rational choices are being made, the 'choose well' campaign is an example of this (NHS 2017). They are not targeted at a specific population type but across all groups. The theoretical framework identified that a range of interacting factors lead to health behaviour decision making, however, this was less well developed in the emergency context (He et al. 2011). The goal of these improving choice campaigns is based on the notion that ambulance services are established to undertake emergency or high acuity work. Therefore the opportunity related to low acuity (24%) of calls has perceived potential for safely decreasing demand. A targeted public health campaign for this group may therefore be appropriate. The findings from the study correlate the following characteristics with increased utilisation for low acuity calls:

- Age 85-90
- Age 90 and over
- Black ethnicity
- SES group 8

A targeted approach for these groups using evidenced marketing techniques may therefore improve uptake.

The message also needs to be considered if it is to be understood and result in behaviour change. The previously tried techniques have focussed on rational choice, as suggested by the reasoned action models. Perception plays a key part in this, if you believe that you do have an emergency interplayed with a culture of fear, then an ambulance may be seen as an appropriate choice (Füredi 2006).

8.3.2 Nudge theory

An emerging way of influencing behaviour change is nudge theory (Thaler & Sunstein 2009). Nudge is underpinned by the concept that individuals frequently behave in a way that economic theory can't predict. They outline that people often don't make sensible rational choices. Nudge intervention therefore focusses on changing the choice architecture for individuals. Nudges are designed to be interventions which are simple but that allow the other choices to still be made. They are grounded in liberation paternalism, that is to offer nudges that are most likely to help and least likely to inflict harm. Camerer et al. (2003) outline asymmetric paternalism as taking steps to help the least sophisticated people whilst causing minimal harm to others. The concept of nudge is therefore to find simple interventions that change the choice architect (Kosters & Van der Heijden 2015).

Ambulance utilisation is within a choice architecture of options available in England when experiencing a health need. Nudge concepts could be applied prior to the selection of an ambulance or once it has been selected to nudge to another option. Intentionally the ambulance service is an easy option in the choice architecture so that it can be utilised in an emergency via the free 999 telephone system. Nudging alternative options may therefore require careful consideration of how the other options are equally or more accessible. Nudging to an alternative service once the ambulance service has been utilised may be easier and safer. 20% of patients attending emergency departments stated they would change their decision if they had known about alternatives (Atenstaedt et al. 2015).

The current triage system is established to quickly identify immediately life threatening emergencies such as cardiac arrest early in the process. In 2017 this was improved further with the introduction of 'nature of call' as part of the Ambulance Response Programme (ARP) (Turner et al. 2017). This programme also introduced another change 'dispatch on disposition' which offers longer to determine the type of call and then the appropriate response. This approach is still paternalistic, with the ambulance service determining the appropriate response. It is possible that once the immediate emergencies have been filtered out that a choice architecture could be presented to the patient encouraging them to self select an alternative to the ambulance service. For example "we have concluded that you do not have an immediate threat to life would you like to be transferred to 111 instead?" As an emerging theory there is differing views on both the effectiveness and the moral use of nudging. Nudge advocates that it keeps the notion of self-control as it still allows all choices to be made (Thaler & Sunstein 2009).

Within the social cognition model is the concept of if-then plans. These plans are constructed to be followed when a set of circumstances occur (Conner & Norman 2015). This may be suitable within the emergency setting, but for cases that occur irregularly it may be that when the crisis moment occurs that patients act differently. Also within the ambulance setting consideration should be given to the in-capacitated patient and the intervention of those around in help seeking. A consideration could be given to including the if-then plans within the triage setting of the ambulance service.

8.3.3 Health change model

There has been numerous studies into how to change health behaviours in relation to unhealthy activities such as smoking, alcohol consumption and eating habits (Ryan et al. 2008, Wakefield et al. 2010, Michie et al. 2012). Established interventions are usually complex and require insight into a range of factors. However, the general opinion is that for behaviour change to occur; capability, opportunity and motivation all need to be present. This is line with the underpinning theory of health behaviour (Fishbein et al. 2000). These factors are supported in a number of models of behaviour change including:

- Needs-Opportunites-Abilities Model (Gatersleben & Vlek 1998)
- Motivation-Opportunities-Abilities Model (ThØgersen et al. 1995)
- The COM-B model of behaviour (Michie et al. 2011)

The COM-B model is a parsimonious model including all three factors that need to be in place for change to occur. The factors are related in a mutually influencing system (See Figure 8-3).

Each of the elements can be explored against the desired ambulance utilisation behaviour of only using for life threatening emergencies as determined by health professionals.

8.3.3.1 Capability

Capability can be linked to the concept of self efficacy and condition understanding. To be effective at choosing the appropriate course of action requires that the

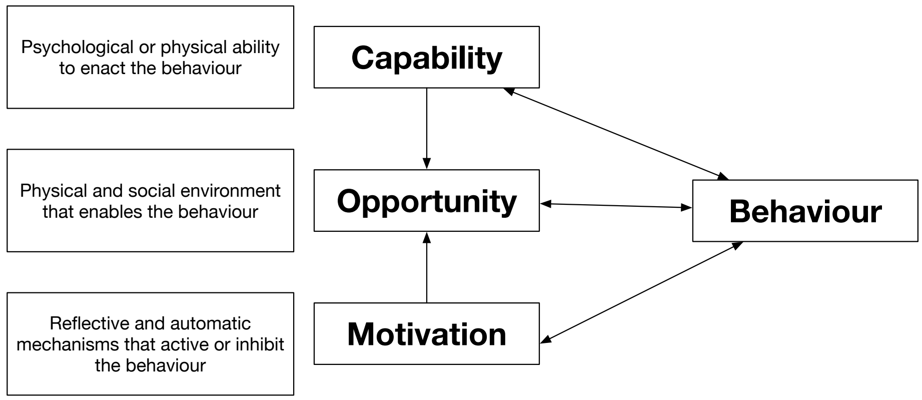

Figure 8-3: COM-B model of behaviour
(Michie et al. 2011)

individual can recognise their condition and then feel able to choose and enact the appropriate management (self efficacy).

8.3.3.2 Opportunity

When presented with a health crisis, if the desired behaviour is an alternative to ambulance utilisation then the opportunity for this needs to be present. Alternatives such as primary care, pharmacy, 111 or self care are usually available. Although the response time is likely to be longer and the access route less familiar.

8.3.3.3 Motivation

The individual motivation for calling an ambulance way be varied, and this is not a widely researched area. The theory would suggest that the individuals are likely to have identified a perceived need and utilised the ambulance service as a course of action. This may include the perceptions of the required time-frame for intervention and the type of practitioner required. If motivation is needed for an alternative behaviour these items will need to be considered.

8.4 Applying to modifiable factors

This section will consider the identified modifiable factors and policy interventions that could be taken based on COM-B, nudge and targeted campaigns.

8.4.1 Social economic status

The SES related to long term unemployed was shown to be a significant factor in increased utilisation. This will partly be correlated with health need, but also potentially with opportunity to consider using the ambulance service as not at work. It is considered a modifiable factor as strategies exist to increase employment rates. It is also a specific group that could be targeted in an education campaign in certain forums i.e. job centres. Nudge is also a possibility for this group in relation to low acuity conditions by making other options accessible.

8.4.2 General health status

General health status was found to be the biggest moderating factor within the study. Improving population health status could be considered a modifiable factor as there is a wide range of approaches to improve life expectancy and the proportion of the population living contently with long term conditions (Tarlov 1999). By increasing population health you could have a positive impact on reducing ambulance utilisation. These strategies could be employed to improve population health and whilst these would have predicted impact on ambulance utilisation the economic benefits probably rest in wider society with increased work and less resilience on services in general.

8.4.3 Self efficacy

Self efficacy is the factor that was most prevalent across the health behaviour theory (Conner & Norman 2015). Within this study however the measure of self efficacy utilised was not shown to be a signifiant moderator for socio-demographics on ambulance utilisation. This may have been related to the methodology or it may be that self efficacy does not play a part in an ambulance utilisation model. self efficacy has a well established theoretical base which asserts that personal mastery are the determinants of behavioural change (Maddux 1995). This can be related to the capability element of the COM-B model and influenced by past experiences. If self efficacy had been a significant moderator this would be an area that nudge or targeted campaigns would have been beneficial in, as their methodology could be employed to improve self efficacy. Self efficacy can also be taught, so interventions in known communities for higher utilisation may prove a good policy intervention if it is a moderating factor (Strecher et al. 1986). However, in light of the study findings this can not currently be recommended.

8.4.4 Social networks

A social network can be considered to be a structure to which an individual belongs (Valente 2010). Within this study the concepts related to the social network were whether it was considered close knit, whether people were willing to help neighbours, the number of close friends you had and how many were in a similar area. It was hypothesised based on the theory that high ratings on these would be related to lower ambulance utilisation as the social network would support decision making for self-treatment or alternatives. The study found that social networks was not a significant moderator for higher or lower utilisation. It is possible that the social network to which you belong may have a set of health beliefs which encourages higher ambulance utilisation, but this was not found in the study. In terms of policy interventions social networks can be created and behaviour change can be applied to groups rather than individuals (Langlie 1977). However, with this not being a significant moderator this can't currently be recommended.

8.4.5 Access to services

Access to services was not explicit in the ITMDEHS, however, both distance to health care facilities and accessibility of these have potential to factor in the choice architecture of ambulance utilisation. The eventual factor used within this study was a constructed variable of distance to hospital and primary care by car and public transport. This was shown to be a significant moderator across all acuity groups. The integrated theory model includes advantages and disadvantages as a factor in health behaviour decision making. Being further away from primary care or hospital may mean that you consider it advantageous to utilise the ambulance service over those who are closer. In relation to the targeted campaigns and nudge this group could be specified for intervention. Those areas further from hospital or primary care facilities for example could be nudged to consider alternatives first. The COM-B model includes opportunity in decision making, it may be that this group do feel they require an ambulance due to the distance to facilities.

8.5 Unmodifiable factors and service design

Having considered the potential policy interventions for modifiable factors this section explores the potential changes that could be made to reduce variation based on the un-modifiable factors. The factors of significance within the study related to higher utilisation include populations with ages over 85, black ethnicity and SES group 8.

A range of different service design options could be considered:

- Triage System
- Clinical Hub Development
- Response options

8.5.1 Triage systems

As previously outlined within the UK there are two approved triage systems for 999 emergency calls (AMPDS and NHSP). In general these systems are not designed to discriminate based on either the location of the caller or the callers demographics. Positive discrimination does occur in relation to known clinical conditions with certain risk factors i.e. age and gender. This study has identified that populations that contain higher proportions of elderly, black ethnicity and SES group 8 have higher utilisation. There is a potential design system option here for low acuity calls. If populations types are using the service differently triage systems could be designed to pick this up either based on location or matching patient demographics. There is a morale question that would need to be considered in relation to planed discrimination in this way, especially the associated political risk (Gulliford & Morgan 2003). Currently the equity of service provision does not have this issue. In relation to the identification of ages over 80 and increased utilisation this is worthy of consideration in an ageing society with prolonged life through advancement in medical treatments. This has created a population that has many multiple co–morbidities living for longer in the community and is resulting in increased ambulance utilisation. In being mortal Atul Gawande challenges the notion of extending life at any cost (Gawande 2015). An alternative triage and response model could be considered for this age group.

8.5.2 Clinical hub developments

In recent years the ambulance service has created clinical hubs to cope with increasing demand. Traditionally ambulance call centres were staffed by non-clinical call handlers who used the triage software to dispatch ambulances. Clinical hubs have introduced clinicians within the call centres to undertake extended triage and advice, especially to low acuity patients. Further development of these hubs has been encouraged through an NHS commissioning initiative to increase hear and treat rates. Support software is utilised for these, but like the triage software does not focus on differentiating by demographics. The findings from this study could be used within the development of such a model.

8.5.3 Response options

The expensive part of demand increase primarily relates to the physical ambulance response rather than taking calls. Wrigley et al. (2002) previously stated that "Callers' perceptions of urgency are known to be unreliable, and a wider range of responses from service providers may be the most appropriate way to manage rising demand". Within this study there has not been significant variation between the results for each acuity category. Different response models could be constructed for population areas identified to be increased users.

8.6 Summary

In summary this chapter has considered each of the variables related to ambulance utilisation in the context of policy and practice change that could be considered to alter the pattern of utilisation. Utilising the theoretical approaches for achieving behavioural change there are potential opportunities for service design and health behaviour change, including establishing an alternative choice architecture. In considering that the population utilise the service differently models of triage and subsequent service response could be different based on the area from which the emergency call has been received.

The chapter has aimed to address the objective 'Given the findings of the research what are the implications and recommendations for policy setting and service design'.

Chapter 9

Conclusion

9.1 Introduction

This chapter brings together the conclusions from the study and considers the research journey. It demonstrates the key contributions of the study, including the England focus, analysis by acuity level, use of MMR and the approach to combining datasets. It identifies the limitations of the study including population base, scope, use of ecological correlation and focus on revealed access. The chapter outlines both the implications for ambulance policy development in England with corresponding recommendations for both practice and further research.

9.2 Thesis summary

In summary this thesis has outlined a new insight into the utilisation of the ambulance service in the East of England. It has taken a step-wise approach to identifying the theory of health service utilisation, a literature review into current knowledge and consideration of available data. It has outlined a systematic examination of the variables individually and tested proposed moderating variables.

The key findings can be summarised against the objectives:

To what extent do socio-demographic factors account for variation in ambulance utilisation.

The study concluded that 25% can be explained by socio-demographic factors.

To what extent does general health of a population moderate ambulance utilisation.

General health status was found to be a significant moderator in all acuity groups by up to 3%.

To what extent does self efficacy moderate ambulance utilisation.

Self efficacy was not found to be a significant moderator in any acuity group.

To what extent does social and support network moderate ambulance utilisation.

Social network variables were not found to be significant moderators in any acuity group.

To what extent does access to services moderate ambulance utilisation.

Access to services, measured by distance to hospital and GP practices was found to be a significant moderator in all acuity groups up to 0.9%.

Given the findings of the research what are the implications and recommendations for policy setting and service design.

The findings support that health behaviour change should be targeted based on an understanding of population characteristics in relation to utilisation.

9.3 Contributions of the study

The methodology utilised makes eight unique contributions to developing the field of ambulance utilisation knowledge.

9.3.1 Use of large data

This study has utilised the emerging field of big data, combining the national datasets of the Census, Understanding Society and Department of Transport to give new insight to ambulance utilisation. Importantly this different approach to researching the topic is replicable in other settings.

9.3.2 English study

The last published studies to be undertaken in England using ambulance utilisation figures was in the 1990s. Since then there have been both societal changes and a significant change in demand. This study provides a contemporary analysis of ambulance utilisation in the English setting.

9.3.3 Acuity

Previous studies have not investigated ambulance utilisation variation by acuity level. This study has explored the factors and associated models by three acuity levels.

9.3.4 Non-conveyance

Previous studies have focussed on analysing patients who have arrived at the emergency department by ambulance. In the current English context approximately 37% of patients are not conveyed to hospital. This study has included all those patients in the analysis.

9.3.5 Development of model

Studying of the moderators is not found within the literature in relation to ambulance utilisation. The underpinning ITMDEHS gave a theoretical concept of emergency service utilisation. This study has explored the model with data and provided understanding in relation to the moderators. It has allowed the exploration of a model for population ambulance service utilisation specifically rather than combined emergency service utilisation.

9.3.6 Practical application

The majority of previous studies in the field of ambulance utilisation have not related recommendations to underlying health behaviour theory. This has resulted in a limited approach in identifying how the findings could be relevant to health care policy development. This study has considered the model in relation to underpinning theory and explored two proposed routes to change health care practice through either targeted health behaviour change or creating different operating models.

9.3.7 Identifying a population group for further study

As outlined in chapter 7, understanding the breadth of components of how individuals make utilisation decisions is wide ranging. In completing this study there remains an outstanding question beyond who makes the decisions, to why individuals choose to make the options they do. This study has identified population characteristics related to ambulance utilisation which provides an opportunity for further research with a specific group (Creswell & Plano Clark 2007).

9.3.8 Population study

Lastly it is a full population study. Whilst this has limitations it is also a benefit in developing policy at population level. By including all calls and all census data in the study for an area there is a greater capture which is not featured in the literature currently.

9.4 Limitations

All studies have limitations. This section identifies eight key limitations and explores potential mitigations and future research considerations.

9.4.1 Ecological correlation

Matching population data as carried out in this study is known as ecological correlation. Whilst it is commonly used, it has a significant limitation known as the ecological fallacy. This was mitigated through low level correlation and also the interpretation of the results at population rather than individual level. Whilst this is a limitation the advantage of the methodology is the ability to include the whole population through the national datasets. Further studies could consider individually surveying those within a geographical area and individually linking to ambulance utilisation episodes.

9.4.2 Inclusion of all calls

The methodology utilised the calls made to the ambulance service with the characteristics of the resident population. The limitation identified in this methodology is that not all calls are made from the place of resident. This was mitigated through workday population correction. Future studies could use a method of capturing calls from non resident locations once the patient is assessed.

9.4.3 Multiple testing

Within this study 32 different regression models were analysed.

- Socio-demographics with Overall, High, Medium and Low acuity utilisation (4 models)
- Self efficacy moderation with Overall, High, Medium and Low acuity utilisation (4 models)

- General health status moderation with Overall, High, Medium and Low acuity utilisation (4 models)
- Access to services moderation with Overall, High, Medium and Low acuity utilisation (4 models)
- Close-knit neighbourhood moderation with Overall, High, Medium and Low acuity utilisation (4 models)
- Number of friends moderation with Overall, High, Medium and Low acuity utilisation (4 models)
- Same area friends moderation with Overall, High, Medium and Low acuity utilisation (4 models)
- Willing to help neighbours moderation with Overall, High, Medium and Low acuity utilisation (4 models)

For each moderation analysis the regression was run with and without interactions. So total regression outputs produced was 60.

Each model was testing a specific hypothesis and the results were analysed for significance. Two error types are possible; type 1 error is the rejection of a true null hypothesis (false positive). Whereas type 2 is failing to reject a false null hypothesis (false negative).

There is a known limitation, multiple-testing, to running multiple models to test a range of hypotheses. When testing models, consideration is given to whether the produced model is significant in drawing conclusions. This is assessed using the p value, which is a measure of the result having occurred by chance (Harris & Taylor 2008).

If multiple-models are conducted the chance of getting a significant result by chance increases, a type 1 error.

One way of correcting for this is by reducing the significance level (p value) tolerance in drawing conclusions, known as the Bonferroni correction. Within this study the p values for the produced models were all less than 0.001, so would still have been significant even post correction (Benjamini & Hochberg 1995).

9.4.4 Moderation analysis

Within this study the model tested was that of the moderation effect of GHS, SE, Social networks and access to services for socio-demographics on ambulance utilisation. This was based on the ITMDEHS theoretical model (see figure 2-3). It was hypothesised that the interactions were a moderated causal relationship (Jaccard et al. 2003) and therefore interaction analysis through moderated multiple regression was utilised. However, within this social behaviour model there are likely to be other interactions going on. A limitation is only testing a selected number of relationships and assuming a casual moderated relationship. It is possible that mediation may also be occurring between factors. Further development using structural equation modelling may support with this, although there is still a need to define the relationships in advance. Testing for mediation and moderation between all variables using big data would be possible in a further study.

9.4.5 Scope

To meet the practical requirements of a professional doctorate the scope was narrowed to only consider which variables are correlated with utilisation and then consider impact in relation to underpinning theory. A broader scope exploring following up potentially through a qualitative approach exploring why certain groups exhibit the behaviour would be beneficial and should feature in further research.

9.4.6 Geographical area

The study was conducted in the East of England. Whilst this geography covers a wide range of social groupings it is in the south of the country and also served by a single health authority and ambulance service. This presents a potential limitation to the generalisation of the results. As the study has been undertaken in a systematic way a further study could be conducted in any of the other UK areas with the same national datasets.

9.4.7 Acuity only

The study went beyond utilisation to consider utilisation by acuity levels. A further step would be to consider variation in relation to specific clinical conditions e.g. chest pain, falls, cardiac arrest etc.

9.4.8 Revealed access

As the study used ambulance utilisation data only it was recording revealed access. The study does not capture therefore those whose behaviour traits did consider an ambulance but were unable to access. Within the UK setting due to a national 999 system and accessibility infrastructure this is unlikely to be a significant limitation. However, it should be considered if the methodology is applied in an international setting.

9.4.9 Understanding society

Whilst understanding society produced statistically significant surveying of the population unlike the census it does not cover everyone. In this approach a full dataset like the others would have allowed all LSOAs to be included.

9.4.10 Health behaviour theory

This study has utilised the underpinning theory related to health behaviour. Whilst this is widely used it is under-developed within the sick role responses and especially response to emergency situations.

9.5 Recommendations for healthcare services

As a study linked to practice development a number of recommendations can be drawn for consideration by ambulance service commissioners.

9.5.1 Education interventions

The widespread use of generic advertising campaigns to alter demand patterns may be limited. This study has identified that targeted campaigns may be more appropriate.

9.5.2 Service operating model

It is clear from this study that ambulance utilisation varies by geographical area and certain population characteristics. Currently the ambulance service has a generic offering. Consideration could be given to provide a specific service based on the location of call through a different triage model.

9.5.3 Service planning

Ambulance services have a history of utilising historic data to plan future provision, especially in relation to meeting response times. This study has identified that prediction on population behaviour may be possible based on population characteristics.

9.6 Recommendations for further research

The following recommendations for further research should be considered. These ideas would further build the knowledge base as identified in the national priorities (Snooks et al. 2009):

- Causes and epidemiology of the rise in demand for emergency calls
- Variations and inequalities in access
- Understanding how services are being used.

9.6.1 Qualitative elements

As outlined the broader research questions of 'why utilise the ambulance service' could be answered using a sequential explanatory design. This methodology could utilise the population groups identified in this study as correlated to varying levels of utilisation and explore qualitatively with the group 'why' they behave that way.

9.6.2 Non ecological correlation

At the time of this study the methodology utilised was matching ambulance data with population data, as individual data was captured on paper in a limited way. However, increasingly electronic data are captured by the ambulance service once arriving with the patient. If the correct characteristics were captured at this point it could be linked to other datasets directly, avoiding ecological correlation.

9.6.3 Different geographical area

The study was undertaken in the East of England. Future research should be considered in other areas both within the UK and also internationally on ambulance utilisation behaviour.

9.6.4 Large dataset development

The OECD is established to promote policies that improve international economic and social well-being. It is considered a key organisation in comparative statistics. In the course of this research it has been identified that the ambulance service and paramedic literature is limited. However, utilisation of ambulance services does appear to be increasing internationally in the literature identified. The OECD whilst comparing utilisation of hospital, primary care services etc. does not explicitly record ambulance utilisation or paramedic workforce numbers. Development of both these areas should be considered to aid international comparison in future studies. Likewise ambulance utilisation data from CAD systems could be collected nationally for secondary analysis research purposes.

9.7 Research journey

In general reflexivity is a process associated with qualitative research, where the research journey is considered in relation to the findings. Within quantitative research such as this the impact of the researchers journey on the outcome is limited. However, as a professional doctoral study the whole process is part of research training. A key part of this is the ability to reflect. Indeed the professional doctorate programme encourages a reflective, and self improvement philosophy throughout. This section reflects on my research training through undertaking this study and how it relates to the professional doctorate programme aims.

Since starting my professional doctorate I have developed both personally and professionally. As a professional doctorate the ethos of the programme is to create expert practitioners and researchers in practice. The programme aims to:

- Carry out independent research and understand research methods whilst remaining in your practice area.
- Choose your learning style within a flexible environment amongst a multi-professional community.
- Expand your understanding of policy and practice in the context of international healthcare systems and service.

It has taken me far longer than I had originally planned to complete this training programme. However, during this time I have moved from being a paramedic lecturer and practising paramedic to a NHS Trust lead for innovation, a consultant practitioner including Trust wide responsibility for research and practice development and finally into a role as an NHS director. I have also moved organisations from the ambulance service, to an acute Trust and lastly a combined community and mental health Trust. I have undertaken national roles with NHS England and the College of Paramedics.

My research journey has included considering the range of research methodologies available and opting for secondary data analysis research as contemporary in the big data movement. Whilst this means I did not conduct traditional original primary data collection I have had to learn a wide range of data analytical skills that are core for this method. This included gaining special access to datasets, understanding their construct and combining datasets within an SQL database environment. I have developed use of the following software packages:

- Stata
- R
- SPSS
- AMOS
- QGIS
- LATEX
- POSTGRESQL
- MPLUS
- Bibtex

As I have changed professional job roles the importance of utilising evidence has become more important and is underpinned by my development on the Doctorate in Health. In 2015 I was appointed a national advisor to the NHSE Urgent Care Programme and was able to utilise areas within this thesis to support national policy development and a mandated Commissioning for Quality and Innovation (CQUIN) scheme.

Part way through the programme I completed a complimentary leadership and self development programme with Harvard University which has given me greater insight into myself and my practice and also the opportunity to undertake international healthcare study and visits.

The research topic in this thesis fits with the University of Bath Department of Health aims to produce high-quality research with a strongly applied focus in the areas of population health and healthcare and has developed myself as a researcher in practice.

I complete the programme having taken up the post of the chair of the College of Paramedics and continuing as a director within the NHS. In these roles I aim to continue to influence practice through research. I published an editorial related to the study concept (See Appendix I).

The journey has not been easy and like any learning process has included lots of ideas and material being discarded. This seems especially true with large data where there is always another way to cut it. I have suffered with being a chronic procrastinator throughout my life and found self study difficult. This has really manifested in completing this study by distance learning over an extended period of time.

However, I have persevered through procrastination and mental health challenges to produce a study which I hope has application to practice. Certainly the research journey has been more than just an academic exercise and I intend to continue my development in my roles both for the College of Paramedics and within the NHS.

9.8 Conclusion

In conclusion this important study has expanded the knowledge of ambulance service utilisation by populations and it develops the theoretical base of how these factors interact. Importantly it has considered how understanding of the factors could be taken into policy development to alter demand behaviours or service design. It completes my professional doctorate training of combining research with implications for practice.

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Appendix A

Ethical Approval

Subject: RE: REACH reference number: EP 15/16 3
Date: Wednesday, 30 September 2015 at 14:31:28 British Summer Time
From: Emma Dowden
To: Martin John (CAMBRIDGE UNIVERSITY HOSPITALS NHS FOUNDATION TRUST)

Dear John,

Thank you for providing more detail about the Ambulance call data and confirming that details of the patients will not be used in this study.

I can confirm this was reviewed and approved under Chair's Action by Dr Gordon Taylor.

Please inform REACH about any substantial amendments made to the study if they have ethical implications.

Best Wishes,

Emma

-----Original Message-----
From: Martin John (CAMBRIDGE UNIVERSITY HOSPITALS NHS FOUNDATION TRUST) [mailto:johnmartin@nhs.net]
Sent: 29 September 2015 07:27
To: Emma Dowden <E.Dowden@bath.ac.uk>
Cc: Alan Buckingham <A.Buckingham@bath.ac.uk>
Subject: RE: REACH reference number: EP 15/16 3

Hi Emma,

(i) Please provide detail on the specific nature of the call data sourced from the Ambulance service.
The data will be an electronic database taken from the computer aided dispatch system that includes:
* Incident number (a sequential number allocated to calls)
* Easting + Northing (geographical location of the call, it provides two co-ordinates based on a UK reference point - it is similar to latitude and longitude)
* Time of call
* Date of call
* AMPDS code (Advanced Medical Priority Dispatch System is an international triage system. It provides a codes which summaries the reason for the call and the acuity level)
* Conveyed to hospital flag (was the patient conveyed to hospital)

(ii) Please provide confirmation that the data be is anonymized and that if the data is call recordings or transcripts, the caller can be not be identifiable?
The data is extracted from the Computer Aided Dispatch system it is not call recordings / transcripts.
The data will include a geographical location to allow matching to output areas for the study. The co-ordinates refer to the location of the 999 call not a specific patient. So the location will not be anonymized but the details of the patient - i.e. name, nhs number etc. are not included in this study.

Happy to explain more if required.

Thanks

John.

From: Emma Dowden [E.Dowden@bath.ac.uk]
Sent: 28 September 2015 15:20
To: Martin John (CAMBRIDGE UNIVERSITY HOSPITALS NHS FOUNDATION TRUST)
Cc: Alan Buckingham
Subject: REACH reference number: EP 15/16 3

Dear John,

Full title of study: 'Hurry! It's an emergency': A study of the variation in emergency ambulance utilisation between geographical areas in the East of England

REACH reference number: EP 15/16 3

The Research Ethics Approval Committee for Health (REACH) reviewed the above application at its meeting held on the 24th September 2015

The Committee request clarification on the following:

(i) Please provide detail on the specific nature of the call data sourced from the Ambulance service.
(ii) Please provide confirmation that the data be is anonymized and that if the data is call recordings or transcripts, the caller can be not be identifiable?

Please address these issues at your earliest convenience.

Kind regards,

Emma

____

[cid:image002.jpg@01D0FA01.2374C1B0]

Emma Dowden, Research Programme Coordinator

University of Bath<http://www.bath.ac.uk/>

Department for Health
University of Bath, Bath BA2 7AY, United Kingdom | Telephone: +44 (0)1225 383891|
Email: e.dowden @bath.ac.uk

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Thank you for your co-operation.

NHSmail is the secure email and directory service available for all NHS staff in England and Scotland NHSmail is approved for exchanging patient data and other sensitive information with NHSmail and GSi recipients NHSmail provides an email address for your career in the NHS and can be accessed anywhere

Appendix B

NRES Exemption

Subject: FW: Ambulance study
Date: Wednesday, 23 November 2016 at 22:57:00 Greenwich Mean Time
From: Martin John (CAMBRIDGE UNIVERSITY HOSPITALS NHS FOUNDATION TRUST)

From: "Queries NRES (HEALTH RESEARCH AUTHORITY)" <nres.queries@nhs.net>
Date: Wed, 27 Mar 2013 15:46:14 +0000
To: John Martin <johnmartin@nhs.net>
Subject: RE: Ambulance study

Dear John

Thank you for your further email enquiry. As you are aware, our leaflet *"Defining Research"*, explains how we differentiate research from other activities, and is published at: http://www.nres.npsa.nhs.uk/applications/is-your-project-research/.

Based on the additional information you have provided, our advice is that the project is not considered to be research according to this guidance and therefore does not require ethical review by an NHS Research Ethics Committee.

I would see this as a service evaluation so it wouldn't need REC review.

If you are undertaking the project within the NHS, you should check with the relevant NHS care organisation(s) what other review arrangements or sources of advice apply to projects of this type. Guidance may also be available from the clinical governance office.

Although ethical review by an NHS REC is not necessary in this case, all types of study involving human participants should be conducted in accordance with basic ethical principles, such as informed consent and respect for the confidentiality of participants. Also, in processing identifiable data there are legal requirements under the Data Protection Act 2000. When undertaking an audit or service/therapy evaluation, the investigator and his/her team are responsible for considering the ethics of their project with advice from within their organisation. University projects may require approval by the university ethics committee. Please refer to our guidance on student research at: http://www.nres.npsa.nhs.uk/applications/guidance/research-guidance/?esctl1654606_entryid62=83668.

This response should not be interpreted as giving a form of ethical approval or any endorsement to your project, but it may be provided to a journal or other body as evidence that ethical approval is not required under NHS research governance arrangements.

However, if you, your sponsor/funder or any NHS organisation feel that the project should be managed as research, and/or that ethical review by an NHS REC is essential, then please write setting out your reasons and we will be pleased to consider your request further.

Where NHS organisations have clarified that a project is not to be managed as research, the Research Governance Framework states that it should not be presented as research within the NHS.

Regards
NRES Queries Line
Ref. 31/04

PLEASE NOTE OUR NEW EMAIL ADDRESS:nres.queries@nhs.net

The NRES Queries Line is an email based service that provides advice from NRES senior management, including operations managers based in our regional offices throughout England. Providing your query in an email helps us to quickly direct your enquiry to the most appropriate member of our team who can provide you with an accurate written response. It also enables us to monitor the quality and timeliness of the advice given by NRES to ensure we can give you the best service possible, as well as use queries to continue to improve and to develop our processes.

Please note:

- If you have been asked to follow a particular course of action by a REC as part of a provisional or conditional opinion, then the REC requirements are mandatory to the opinion, unless specifically revised by that REC.
- Should you wish to query the REC requirements, this should either be through contacting the REC direct or, alternatively, the relevant local operational manager (details available from the NRES website NRES - NRES Office and Departmental Contact Details).

NRES Queries

Health Research Authority
National Research Ethics Service (NRES)
Ground Floor, Skipton House, 80 London Road, London SE1 6LH

Email: nres.queries@nhs.net | www.hra.nhs.uk and www.nres.nhs.uk

If your email is regarding a formal request for information under the Freedom of Information Act, please resend to hra.foi@nhs.net to ensure it is dealt with promptly

Streamline your research application process with IRAS (Integrated Research Application System): www.myresearchproject.org.uk

P Help save paper - do you need to print this email?

From: Martin John (EAST OF ENGLAND AMBULANCE SERVICE NHS TRUST)
Sent: 25 March 2013 21:46
To: Queries NRES (HEALTH RESEARCH AUTHORITY)
Subject: Ambulance study

Hi,

Please could you provide advise on the requirement for REC approval for the following project.

- Comparison of 999 ambulance call data and clinician completed patient care record
- Ecological correlation of 999 ambulance call data with socio-demographic data sets (I.e. Census, Health acorn)

In reviewing this I do not believe this to be audit as there is not a standard to which I am comparing.
New data is not being created, however a new combined dataset will be created from existing data sets. Does this constitute research / public health surveillance?

Consent will not be sought from the participants, but all 999 callers to the ambulance service over a period of time will be entered, information will be available on the public website, with the option to withdraw if required. As all 999 callers will be entered into the study this will include vulnerable groups, prisoners, children, care homes etc.

I believe the following questions are relevant from the set on your website:

B9 – I will be analysing the data and although I have access to the data I am not a direct member of the 'normal care team'

B12 – Yes all 999 calls will be included including nursing homes

C1 – Yes past access to the NHS via ambulance service

C5 – 999 calls from prisons will be included

Many Thanks

John.

Appendix C

Understanding Society Special Access Request

UK Data Service

Special Licence

Institute for Social and Economic Research (UK access only)

Public

3 May 2016

Version: 05.00

T +44 (0)1206 872572
E susan@essex.ac.uk
ukdataservice.ac.uk

Special Licence – Institute for Social and Economic Research

Definitions

- Licence holder – the licence holder specified in section 2
- Data depositor – Institute for Social and Economic Research
- Data – the collections detailed in section 6
- Dispute arbitrator – ESRC

1. Researcher application form

Details of the Principal Investigator/Project lead

Name of Principal Investigator/Project Lead	John Martin
Institution or Organisation	University of Bath / Cambridgeshire and Peterborough NHS Foundation Trust
Institution Email:	Johnmartin@nhs.net / Jwm25@bath.ac.uk
UK Data Service Project Number	91135

2. Your details

Your Name	John Martin
Institution or Organisation	University of Bath / Cambridgeshire and Peterborough NHS Foundation Trust
Address	50 Brookfield Way, Lower Cambourne, Cambridgeshire, CB23 5ED
Telephone No.	07803 504231
Institution Email:	Johnmartin@nhs.net / Jwm25@bath.ac.uk

3. Location

Please state the site and include the address of where the data will be accessed **and stored**, including your institution name

Cambridgeshire and Peterborough NHS Foundation Trust Elizabeth House,

Fulbourn Hospital,
Fulbourn,
Cambridge,
CB21 5EF.

If the location is different to the organisation/institution specified in your registration details, please state the reasons in the box below:

I am a distant learning doctoral student with the University of Bath, hence my NHS Trust as a local secure location for access and storage.

4. Title of research

'Hurry! It's an emergency': A study of the variation in emergency ambulance utilisation between geographical areas in the East of England.

5. Describe the research proposal

The prime focus for accessing the data should be for research purposes and not for the purpose of personal or commercial gain. Don't forget to include:

- the purpose of the research
- what you are trying to find out
- what hypotheses you are testing
- how your findings will benefit society

Within the UK there is a policy intent to reduce ambulance service utilisation. For this to occur targeted interventions are needed which should be grounded in a clear understanding of population behaviour in relation to current ambulance service use.

Utilising the ambulance service can be considered a help seeking behaviour in relation to a perceived need, and as such can be studied through theoretical frameworks that propose factors related to the utilization behaviour. **This study seeks to explore the factors related to the behaviour of emergency ambulance service utilisation in the East of England (UK).**

It is proposed that ambulance call data for a one year period (2011) will be acquired and linked at geographical level (Lower Super Output Area) to three other datasets; the census, understanding society household survey and department of transport access to services.

Structural Equation Modelling will then be used to identify the weighting and interaction of each of the factors to usage at varying acuity levels of calls for the population.

The study aims to identify to what extent does:

- socio-demographic factors account for variation in ambulance utilisation
- general health of a population moderate ambulance utilisation
- self efficacy mediate ambulance utilisation
- social and support network moderate ambulance utilisation

- access to services mediate utilisation

The factors to be studied have been selected based on health behaviour theory and specifically an integrated theoretical model of demand for emergency health services (Toloo et al, 2011 & 2013). The model proposes the following factors:

- Socio-demographics (sourced from the 2011 Census)
- General Health (sourced from the 2011 Census)
- Self Efficacy
- Social and Support Network
- Access to Services (sourced from the Department of Transport)

Access to Understanding Society is requested to identify the population characteristics in relation to self efficacy, social and support networks and quality of health-care services.

The dependent variable will be population (LSOA) ambulance utilisation by six acuity levels. The independent variables will be population characteristics based on the model.

The interaction of the independent and dependent variables will be described and then analysed using Structural Equation Modelling.

The output is to identify how the population characteristics identified in the theoretical model account for variation in ambulance utilisation by varying acuity levels.

Studying this will benefit society by developing the theoretical model of ambulance utilisation in the English setting and making recommendations in relation to service design and configuration to meet population need.

6. Data requested

Title of dataset / Study Number (if known)
Having considered the integrated theoretical model for emergency service utilization I am requesting 3 modules from the main survey - SN7248 Understanding Society: Waves 1-6, 2009-2015: Special Licence Access, Census 2011 Lower Layer Super Output Areas. Main Survey Wave 5. Self-Completion Adult Self-Efficacy module (scaselfefficacy_w5) Main Survey Wave 3. Local Neighbourhood module (localnieghbourhood_w3) Main Survey Wave 6. Social networks module (socialnetworks_w6)

Access to these will allow consideration of neighbourhood makeup including proportion of family and friend support locally, self efficacy evaluation using a recognised scale and quality and accessibility of local health facilities.

7. Justification

Please provide a justification as to why you are requesting access to these data. You should include:

- An explanation as to why you require these data, including information about specific variables or questions of interest and how you'll use these in your research
- An explanation demonstrating that you have considered alternative sources of data, and reasons why these data are not sufficient for your research

IMPORTANT: when applying for social survey data, we strongly recommend that you consider using less restrictive versions of the data that are available. Please visit ukdataservice.ac.uk and use the Discover search function to locate less restrictive sources.

The study aims to explore the population factors associated with variation in ambulance utilisation. To do this ambulance usage data is collected at geographical level and linked with population characteristics. This will include socio-demographic variables and general health need sourced from the census as well as access to services data from the department of transport.

To cover the factors cited within the integrated theoretical model of demand for emergency health services population information is required on self efficacy, social and support networks and quality of services.

Special access is requested so this data can be linked at Lower Super Output Area (LSOA) level allowing exploration of variation in utilisation at this population level across the East of England geographical area.

Questions of interest include:
Social networks:

- Rating for "this is a close-knit neighbourhood"
- Rating for "People around here are willing to help their neighbours."
- Number of " how many close friends would you say you have?"
- Rating for "Proportion of your friends who live in your local area"

Self Efficacy:

- I can always manage to solve difficult problems if I try hard enough.
- If someone opposes me, I can find the means and ways to get what I want.
- It is easy for me to stick to my aims and accomplish my goals.
- I am confident that I could deal efficiently with unexpected events.
- Thanks to my resourcefulness, I know how to handle unforeseen situations.
- I can solve most problems if I invest the necessary effort.
- I can remain calm when facing difficulties because I can rely on my coping abilities.
- When I am confronted with a problem, I can usually find several solutions.
- If I am in trouble, I can usually think of a solution.
- I can usually handle whatever comes my way

Access & Quality of health facilities:
- Rating for quality of "local area medical facilities"
- Rating for "Are you able to access all services such as healthcare, food shops or learning facilities when you need to?'

8. Provide the details of any planned data linkage

Please provide the following precise information:

- A description of the data source(s) you intend to have linked to the data
- A summary of the key variables you'll be using from the source(s)
- A summary of the linking methodology: what is the linking variable?
- Justification for the linking (e.g. how the linked data will help you to undertake your research, and why: explain which variables are needed from your source of data).

To address the elements of the theoretical model the intent is to link together the following data-sets covering each of the factors at population levels (LSOA).

- Ambulance Utilisation (East of England Ambulance Service).
  - Number of emergency calls during 1 year period.
- Socio-demographics (sourced from the 2011 Census)
  - Proportion of population:
    - Gender
    - Age
    - Ethnicity
    - Country of birth
    - Socio-economic status
- Proportion of population General Health status (sourced from the 2011 Census)
- Self Efficacy (Understanding Society)
  - Proportion of population on self efficacy scale
- Social and Support Network (Understanding Society)
  - Proportion of population with support network
- Quality of Service (Understanding Society)
  - Proportion of population with quality of services
- Access to Services (sourced from the Department of Transport)
  - Distance to services.

The link variable will be the LSOA code for each population factor. The study is at area population level so it will be aggregated answers for each factor linked to the number of emergency calls for that population over a 12 month period.

9. Period of access

Access will initially be granted for one year from the date permission is granted and an option to request an extension will be automatically sent when the project nears completion. You will receive an automatic email one month before the project expires.

10. Research team

Please list the names of all member(s) of your research team and a contact email address:

Name	**Email address**

11. Outputs

Details of the products/outputs that will be produced from your use of the data (e.g. analysis, reports, tables, books)

1. Doctoral Thesis 2. Journal Publication 3. Sharing findings within the NHS

12. Protection of confidentiality in outputs

Describe the methods you will use to determine whether outputs are disclosive and the measures you will use to protect confidentiality.

Methods and standards specified in the Microdata Handling and Security Guide to Good Practice and ONS Statistical Disclosure Control for tables produced from surveys must be applied to statistical outputs.

To comply with the requirements the data for this study will be entered into a secure Postgres SQL database with Advanced Encryption Standard (AES) crypotographically protecting the database. The data will be stored on a stand-alone PC physically secured on a UK site at the institution (Cambridgeshire and Peterborough NHS Foundation Trust). This is an access controlled property not accessible to the general public.

The following will be in place:

- The PC will be protected with pass-phrases
- The PC will have full disk encryption
- The PC will be protected with a screen-saver with an interval of less than five minutes that requires a secure pass-phrase to unlock it.
- If the PC is connected to a network it will be connected to an NHS secured LAN via a hard connection.
- The PC will be stored in a locked office when unattended
- The PC will not be connected to any other network including WiFi and Bluetooth.

The data will be deleted in-line with the guidance on completion of the project.

Each output produced will be considered against the guidance by combination of myself and doctoral supervisors. The thesis once completed will be subject to external viva prior to any publication and the guidance will be drawn to their attention for scrutiny.

The potential risk of disclosure results from the matching of understanding society to households at LSOA level. To mitigate this reports will be at aggregated level. There is no identifiable information from the ambulance data-set just number of emergency calls per LSOA area.

13. Funding

Is your research being funded? **NO**

If Yes, has funding been obtained: YES / NO / NOT YET HEARD

If yes, which organisation/institution is funding the research

Name of organisation

14. Declaration

The data to which this Licence permits access are made available under 'Special Conditions', as specified in section 5 of the End User Licence (EUL). Access to the data is conditional upon signing this Declaration.

The licence holder:

- has read and will abide by the Microdata Handling and Security: Guide to Good Practice;
- will take all necessary administrative, technical and organisational measures to ensure that the data are used only in the manner stated and for the proposal specified;
- confirms that access to the data is required in order to meet the aims of the proposal and that the access is proportionate and not excessive to the stated purpose;
- will not process, disseminate or otherwise allow any of the data to be made available or used for any other purpose whatsoever and will remain bound by this obligation once the period of access has expired;
- guarantees that none of these data will be distributed to third parties;
- guarantees that any duplication of the data will only be for the purpose of making personal copies to aid their own research and analysis;
- will not attempt to use these data after the period of access has expired;
- will not attempt to identify by any means whatsoever, any individual, household or organisation in the data , nor will the licence holder claim to have done so;
- will comply with the data security requirements in the Microdata Handling and Security: Guide to Good Practice;
- guarantees that the prime focus for accessing the data is for research purposes and not for the purpose of personal or commercial gain;
- guarantees that any outputs made available to anyone other than those named on the Licence (who must also have signed this Declaration), will meet required standards, including the guarantee, methods and standards contained in the Code of Practice for Official Statistics and the ONS Statistical Disclosure Control for tables produced from surveys;
- will apply methods and standards specified in the Microdata Handling and Security Guide to Good Practice for disclosure control for statistical outputs;
- will supply to the UK Data Archive the bibliographic details of any published work based wholly or in part on the data collection/s accessed. Details are to be provided on publication;
- will not match or attempt to match individual or household records to any other data source at the level of individual or household. Only area-level descriptors or other group-level classifications may be matched for analysis purposes;
- where the data depositor so requires, must supply a copy of any proposed publication, based wholly or in part on the data collections accessed, to enable the data depositor to consider it and comment as regards compliance with the conditions for disclosure protection and will make any [reasonable] changes that are required by the data depositor in order to make the proposed publication comply with these conditions;
- will, at the end of the access period, destroy all copies of the data, including temporary copies, CDs, printed copies, personal copies, back-ups, derived datasets and all electronic copies;
- will ensure that the data are destroyed to the standards specified in the Microdata Handling and Security: Guide to Good Practice;
- will, at the end of the access period, sign and send to the UK Data Archive a declaration to confirm that all copies of the data have been destroyed and to the required standards;
- will report promptly non-compliance with any of the terms of this Licence;
- confirms the accuracy of any information provided to support this application;

- will abide by any other requirements made by the UK Data Archive relating to this use of data;
- understands that the principles of the Freedom of Information Act apply and nothing provided in this Licence is confidential to the licence holder or to the data depositor. To disclose the details of the Licence would not be a breach of any duty of confidence and therefore the details would be made available to the public on request.

Data requested under the Special Licence will only be accessed at a site that has security standards that meet the requirements outlined in the document *Microdata Handling and Security: Guide to Good Practice*.

Data will **not** be accessed at a location outside the UK.

Additional conditions of access specified by the depositor

NON-COMPLIANCE PROCEDURES

Any non-compliance with any of the provisions of this Licence will result in the immediate termination of the licence holder's access to the data, the termination of the licence and the prohibition of any further access to the data depositor's data via the Special Licence. It will also lead to immediate termination of the services provided by the UK Data Archive data team, either permanently or temporarily (as stated in section 16 of the EUL). The Licence Holder's institution will be informed of non-compliance.

Non-compliance with any of the provisions of this Licence may result in sanctions being sought against the licence holder. These may include legal proceedings being taken by the data depositor for breach of obligations under statute or common law.

DISPUTE PROCEDURES

Any disputes arising from the use of the data and/or the terms of this licence will be resolved initially between the UK Data Archive, on behalf of the University of Essex and the Licence Holder. Otherwise, outstanding issues will be referred to the dispute arbitrator.

Licence holder signature

I have read, understood and will abide by (you must tick all three boxes)

☒ any and all terms and conditions of this Declaration

☒ any additional conditions of access specified by the depositor

☒ the Microdata Handling and Security: Guide to Good Practice

Name	Signature	Date
John William Martin		20th March 2017

Appendix D

Advanced Medical Priority Dispatch Code Set

1 Abdominal Pain / Problems

2 Allergies (reactions) Envenomations (stings / bites)

3 Animal Bites / Attacks

4 Assault / Sexual Assault

5 Back Pain (Non-traumatic or non-recent trauma)

6 Breathing Problems

7 Burns (Scalds) / Explosion

8 Carbon Monoxide / Inhalation / Hazchem

9 Cardiac or Respiratory Arrests / Death

10 Chest Pain

11 Choking

12 Convulsions / Fitting

13 Diabetic Problems

14 Drowning (near) / Diving / Scuba Accident

15 Electrocution / Lightning

16 Eye Problems / Injuries

17 Falls

18 Headache

19 Heart Problems / A.I.C.D.

20 Heat / Cold Exposure

21 Haemorrhage / Lacerations

22 Industrial / Machinery Accidents

23 Overdose / Poisoning (ingestion)

24 Pregnancy / Childbirth / Miscarriage

25 Psychiatric / abnormal behaviour / suicide attempt

26 Sick Person (Specific Diagnosis)

27 Stab / Gunshot / Penetrating Trauma

28 Stroke (CVA)

29 Traffic / Transportation Accidents

30 Traumatic Injuries (specific)

31 Unconscious / Fainting (Near)

32 Unknown Problem (collapse - 3rd party)

Appendix E

Understanding Society Variables

Extracted from c_indresp_ukda_data_dictionary.rtf

Pos. = 223 Variable = **c_nbrcoh1** Variable label = close-knit neighbourhood
This variable is numeric, the SPSS measurement level is SCALE
Value label information for c_nbrcoh1
Value = 1.0 Label = strongly agree
Value = 2.0 Label = agree
Value = 3.0 Label = neither agree nor disagree
Value = 4.0 Label = disagree
Value = 5.0 Label = strongly disagree
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 224 Variable = **c_nbrcoh2** Variable label = people willing to help their neighbours
This variable is numeric, the SPSS measurement level is SCALE
Value label information for c_nbrcoh2
Value = 1.0 Label = strongly agree
Value = 2.0 Label = agree
Value = 3.0 Label = neither agree nor disagree
Value = 4.0 Label = disagree
Value = 5.0 Label = strongly disagree
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 288 Variable = **c_simarea** Variable label = proportion of friends living in
This variable is numeric, the SPSS measurement level is SCALE
Value label information for c_simarea
Value = 1.0 Label = all are in the local area
Value = 2.0 Label = more than half
Value = 3.0 Label = about half
Value = 4.0 Label = less than half
Value = 5.0 Label = or none?
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusa

Pos. = 191 Variable = **c_locserb** Variable label = standard of local services: medical
This variable is numeric, the SPSS measurement level is SCALE
Value label information for c_locserb
Value = 1.0 Label = excellent
Value = 2.0 Label = very good
Value = 3.0 Label = fair
Value = 4.0 Label = poor
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 194 Variable = **c_servacc** Variable label = able to access services when need to
This variable is numeric, the SPSS measurement level is SCALE
Value label information for c_servacc
Value = 1.0 Label = yes
Value = 2.0 Label = no
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 290 Variable = **c_closenum** Variable label = how many close friends
This variable is numeric, the SPSS measurement level is SCALE
Value label information for c_closenum
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal
Value = -1.0 Label = don't know
Value = -9.0 Label = missing

Extracted from e_indresp_ukda_data_dictionary.rtf

Pos. = 1506 Variable = **e_se1** Variable label = solve difficult problems if try hard enough
This variable is numeric, the SPSS measurement level is SCALE
Value label information for e_se1
Value = 1.0 Label = not at all true
Value = 2.0 Label = hardly true
Value = 3.0 Label = moderately true
Value = 4.0 Label = exactly true
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 1507 Variable = **e_se2** Variable label = someone opposes me can find ways to get what i want
This variable is numeric, the SPSS measurement level is SCALE
Value label information for e_se2
Value = 1.0 Label = not at all true
Value = 2.0 Label = hardly true
Value = 3.0 Label = moderately true
Value = 4.0 Label = exactly true
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 1508 Variable = **e_se3** Variable label = easy to stick to aims and accomplish goals
This variable is numeric, the SPSS measurement level is SCALE
Value label information for e_se3
Value = 1.0 Label = not at all true
Value = 2.0 Label = hardly true
Value = 3.0 Label = moderately true
Value = 4.0 Label = exactly true
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 1509 Variable = **e_se4** Variable label = confident can deal with unexpected events
This variable is numeric, the SPSS measurement level is SCALE

Value label information for **e_se4**

Value = 1.0 Label = not at all true
Value = 2.0 Label = hardly true
Value = 3.0 Label = moderately true
Value = 4.0 Label = exactly true
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 1510 Variable = **e_se5** Variable label = know how to handle unforeseen situations
This variable is numeric, the SPSS measurement level is SCALE

Value label information for e_se5

Value = 1.0 Label = not at all true
Value = 2.0 Label = hardly true
Value = 3.0 Label = moderately true
Value = 4.0 Label = exactly true
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 1511 Variable = **e_se6** Variable label = can solve problems if invest effort
This variable is numeric, the SPSS measurement level is SCALE

Value label information for e_se6

Value = 1.0 Label = not at all true
Value = 2.0 Label = hardly true
Value = 3.0 Label = moderately true
Value = 4.0 Label = exactly true
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 1512 Variable = **e_se7** Variable label = remain calm when facing difficulties
This variable is numeric, the SPSS measurement level is SCALE
Value label information for e_se7
Value = 1.0 Label = not at all true
Value = 2.0 Label = hardly true
Value = 3.0 Label = moderately true
Value = 4.0 Label = exactly true
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 1513 Variable = **e_se8** Variable label = can find several solutions to problems
This variable is numeric, the SPSS measurement level is SCALE
Value label information for e_se8
Value = 1.0 Label = not at all true
Value = 2.0 Label = hardly true
Value = 3.0 Label = moderately true
Value = 4.0 Label = exactly true
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 1514 Variable = **e_se9** Variable label = if in trouble, can think of solution
This variable is numeric, the SPSS measurement level is SCALE
Value label information for e_se9
Value = 1.0 Label = not at all true
Value = 2.0 Label = hardly true
Value = 3.0 Label = moderately true
Value = 4.0 Label = exactly true
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Pos. = 1515 Variable = **e_se10** Variable label = can usually handle what comes my way
This variable is numeric, the SPSS measurement level is SCALE

Value label information for e_se10

Value = 1.0 Label = not at all true
Value = 2.0 Label = hardly true
Value = 3.0 Label = moderately true
Value = 4.0 Label = exactly true
Value = -1.0 Label = don't know
Value = -9.0 Label = missing
Value = -8.0 Label = inapplicable
Value = -7.0 Label = proxy
Value = -2.0 Label = refusal

Appendix F

Example Postgres Code

EXAMPLE AGE TABLE CREATION KS102ew_2011_oa

```
create table KS102ew_2011_oa (GeographyCode varchar(20),
KS102EW0001 double precision,KS102EW0002 double
precision,KS102EW0003 double precision,KS102EW0004 double
precision,KS102EW0005 double precision,KS102EW0006 double
precision,KS102EW0007 double precision,KS102EW0008 double
precision,KS102EW0009 double precision,KS102EW0010 double
precision,KS102EW0011 double precision,KS102EW0012 double
precision,KS102EW0013 double precision,KS102EW0014 double
precision,KS102EW0015 double precision,KS102EW0016 double
precision,KS102EW0017 double precision,KS102EW0018 double
precision,KS102EW0019 double precision,KS102EW0020 double
precision,KS102EW0021 double precision,KS102EW0022 double
precision,KS102EW0023 double precision,KS102EW0024 double
precision,KS102EW0025 double precision,KS102EW0026 double
precision,KS102EW0027 double precision,KS102EW0028 double
precision,KS102EW0029 double precision,KS102EW0030 double
precision,KS102EW0031 double precision,KS102EW0032 double
precision,KS102EW0033 double precision,KS102EW0034 double
precision,KS102EW0035 double precision);
```

EXAMPLE POINT-IN-POLYGON MATCHING

```
create table all_calls as
select b.oa11cd,count(oa11cd) from dots a, oa_population b
where ST_intersects(a.geom, B.geom)
group by oa11cd
```

EXAMPLE COUNTING ACUITY

```
create table master_oa as
 select b.oa,
    count(*) filter (where substring(ampds,3,1) = 'A') as A,
    count(*) filter (where substring(ampds,3,1) = 'B') as B,
    count(*) filter (where substring(ampds,3,1) = 'C') as C,
    count(*) filter (where substring(ampds,3,1) = 'D') as D,
    count(*) filter (where substring(ampds,3,1) = 'E') as E,
    count(*) filter (where substring(ampds,3,1) = 'O') as O,
    count(*) filter (where ampds is NULL) as BLANK,
    count(*) filter (where a.oa is not null) as total

FROM new_dots a left join eoe_oa_lookup b on a.oa=b.oa  group
by b.oa
```

EXAMPLE UNDERSTANDING SOCIETY AGGREGATION

```
Copy ( select b.lsoa, c.callsper100, COUNT(*) as Total,
            SUM(CASE WHEN c_locserb = '1' THEN 1 ELSE 0 END)
AS excellent,
```

```
            SUM(CASE WHEN c_locserb = '2' THEN 1 ELSE 0 END)
AS verygood,
            SUM(CASE WHEN c_locserb = '3' THEN 1 ELSE 0 END)
AS fair,
            SUM(CASE WHEN c_locserb = '4' THEN 1 ELSE 0 END)
AS poor
from us_neighbourhood a inner join eoe_lsoa b on
a.c_lsoa11=b.lsoa left join lsoa_all_100 c on b.lsoa=c.lsoa
group by b.lsoa,c.callsper100) To
'/DHEALTH_MASTER/DATA/us_qualityofhealth.csv' with (format
csv, header);
```

EXAMPLE JOINING TO CREATE EXPORT FOR ANALYSIS

```
select a.oa,a.lsoa,a.msoa,
ks101ew0001 population,
ks101ew0009 male,
ks101ew0010 female,
ks102ew0020 age0_4,
ks102ew0021 age5_7,
ks102ew0022 age8_9,
ks102ew0023 age10_14,
ks102ew0024 age15,
ks102ew0025 age16_17,
ks102ew0026 age18_19,
ks102ew0027 age20_24,
ks102ew0028 age25_29,
ks102ew0029 age30_44,
ks102ew0030 age45_59,
ks102ew0031 age60_64,
ks102ew0032 age65_74,
ks102ew0033 age75_84,
ks102ew0034 age85_89,
ks102ew0035 age90over,
(ks201ew0020+ks201ew0021+ks201ew0022+ks201ew0023)
ethnic_white,
(ks201ew0024+ks201ew0025+ks201ew0026+ks201ew0027)
ethnic_mixed,
(ks201ew0028+ks201ew0029+ks201ew0030+ks201ew0031+ks201ew0032)
ethnic_asian,
(ks201ew0033+ks201ew0034+ks201ew0035) ethnic_black,
(ks201ew0036+ks201ew0037) ethnic_other,
(ks204ew0011+ks204ew0012+ks204ew0013+ks204ew0014+ks204ew0015+k
s204ew0016) as country_uk,
(ks204ew0017+ks204ew0018) country_europe,
ks204ew0019 country_Other,
ks611ew0017 SES_1,
ks611ew0020 SES_2,
ks611ew0021 SES_3,
ks611ew0022 SES_4,
ks611ew0023 SES_5,
```

```
ks611ew0024 SES_6,
ks611ew0025 SES_7,
ks611ew0026 SES_8,
ks611ew0030 SES_Students,
ks301ew0023 health_verygood,
ks301ew0024 health_good,
ks301ew0025 health_fair,
ks301ew0026 health_bad,
ks301ew0027 health_verybad,
A,
B,
C,
D,
E,
O,
BLANK,
total,
(total/ks101ew0001)*1000 S_total,
((D+E)/ks101ew0001)*1000 S_high,
((B+C)/ks101ew0001)*1000 S_medium,
((A+O)/ks101ew0001)*1000 S_low

 from eoe_oa_lookup a left join ks101ew_2011oa b on
a.oa=b.geographycode
 left join ks102ew_2011_oa c on a.oa=c.geographycode
 left join ks201ew_2011_oa d on a.oa=d.geographycode
 left join ks204ew_2011_oa e on a.oa=e.geographycode
 left join ks611ew_2011_oa f on a.oa=f.geographycode
 left join ks301ew_2011_oa g on a.oa=g.geographycode
 left join close_knit_avg h on a.lsoa=h.lsoa
 left join willing_help_avg i on a.lsoa=i.lsoa
 left join friends_avg j on a.lsoa=j.lsoa
 left join simarea_avg q on a.lsoa=q.lsoa
 left join se3 k on a.lsoa=k.lsoa
 left join jts0505 l on a.lsoa=l.lsoa
 left join jts0506 m on a.lsoa=m.lsoa
 left join health_fac_avg n on a.lsoa=n.lsoa
 left join serv_access_avg o on a.lsoa=o.lsoa
 left join master_oa_workday p on a.oa=p.oa
```

Appendix G

Model Testing Syntax (Stata)

```
capture log close
capture clear

cd "/DHEALTH/STATA/final/"

log using "output.txt", replace t
use "final.dta"

*jnsn transformation first

*population male female age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age30_44 age45_59 age60_64
age65_74 age75_84 age85_89 age90over ethnic_white ethnic_mixed
ethnic_asian ethnic_black ethnic_other country_uk
country_europe country_other ses_1 ses_2 ses_3 ses_4 ses_5
ses_6 ses_7 ses_8 ses_students health_verygood health_good
health_fair health_bad health_verybad social_close_knit
social_help social_friends same_area_friends efficacy_1
efficacy_2 efficacy_3 efficacy_4 efficacy_5 efficacy_6
efficacy_7 efficacy_8 efficacy_9 efficacy_10 efficacy_total
hospital_public_transport hospital_car gp_public_transport
gp_car health_facility service_access a b c d e o blank total
s_total s_high s_medium s_low

jnsn s_total, gen(s_total_jnsn)
jnsn s_high, gen(s_high_jnsn)
jnsn s_medium, gen(s_medium_jnsn)
jnsn s_low, gen(s_low_jnsn)


*Calculate latent variables
gen efficacy_new = (efficacy_1 + efficacy_2 + efficacy_3 +
efficacy_4 + efficacy_5 + efficacy_6 + efficacy_7 + efficacy_8
+ efficacy_9 + efficacy_10) / 10

gen general_health_status = (health_verygood*5 + health_good*4
+ health_fair*3 + health_bad*2 + health_verybad*1)

*Reasonable alpha
alpha hospital_public_transport hospital_car
gp_public_transport gp_car
sum hospital_public_transport hospital_car gp_public_transport
gp_car

*Standardising measures to have equal ranges
gen hospital_public_transport_temp =
(hospital_public_transport - 5)*(100/115)
gen hospital_car_temp = (hospital_car - 6)*(100/44)
gen gp_public_transport_temp = (gp_public_transport -
1)*(100/82)
gen gp_car_temp = (gp_car - 6)*(100/11)
```

```
sum hospital_public_transport_temp hospital_car_temp
gp_public_transport_temp gp_car_temp
gen access_to_services = (hospital_public_transport_temp +
hospital_car_temp + gp_public_transport_temp + gp_car_temp)/4

alpha social_close_knit_jnsn social_help_jnsn
social_friends_jnsn same_area_friends_jnsn
* Low Alpha for social networks
* Run as separate

*Centering variables for interaction effects

*Independent variables
*Age, gender, ethnicity, country of birth, socio-economic
status
sum age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19
age20_24 age25_29 age30_44 age45_59 age60_64 age65_74 age75_84
age85_89 age90over, sep(0)
replace age0_4 = (age0_4 - 6.116077) / 2.022048
replace age5_7 = (age5_7 - 3.421826) / .9632884
replace age8_9 = (age8_9 - 2.174451) / .6267276
replace age10_14 = (age10_14 - 5.926189) / 1.462111
replace age15 = (age15 - 1.262877) / .4206355
replace age16_17 = (age16_17 - 2.546495) / .7739021
replace age18_19 = (age18_19 - 2.277175) / 1.458517
replace age20_24 = (age20_24 - 5.870418) / 3.228293
replace age25_29 = (age25_29 - 6.085941) / 3.010952
replace age30_44 = (age30_44 - 20.1382) / 4.369393
replace age45_59 = (age45_59 - 19.95609) / 3.433463
replace age60_64 = (age60_64 - 6.45996) / 2.141289
replace age65_74 = (age65_74 - 9.211519) / 3.663386
replace age75_84 = (age75_84 - 6.079177) / 2.866933
replace age85_89 = (age85_89 - 1.624746) / 1.009225
replace age90over = (age90over - .8488518) / .7239442
sum age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19
age20_24 age25_29 age30_44 age45_59 age60_64 age65_74 age75_84
age85_89 age90over, sep(0)

sum male female
replace male = (male - 49.11899) / 2.005114
replace female = (female - 50.88101) / 2.005114
sum male female

sum ethnic_white ethnic_mixed ethnic_asian ethnic_black
ethnic_other
replace ethnic_white = (ethnic_white - 91.1635) / 10.78451
replace ethnic_mixed = (ethnic_mixed - 1.894443) / 1.226359
replace ethnic_asian = (ethnic_asian - 4.52115) / 7.978923
replace ethnic_black = (ethnic_black - 1.94646) / 2.851686
replace ethnic_other = (ethnic_other - .4744463) / .6368903
sum ethnic_white ethnic_mixed ethnic_asian ethnic_black
ethnic_other
```

```
sum country_uk country_europe country_other
replace country_uk = (country_uk - 90.1255) / 8.349724
replace country_europe = (country_europe - 3.51888) / 3.412368
replace country_other = (country_other - 6.355624) / 5.942775
sum country_uk country_europe country_other

sum ses_1 ses_2 ses_3 ses_4 ses_5 ses_6 ses_7 ses_8, sep(0)
replace ses_1 = (ses_1 - 21.65686) / 11.30455
replace ses_2 = (ses_2 - 21.68398) / 5.458726
replace ses_3 = (ses_3 - 14.04241) / 3.134798
replace ses_4 = (ses_4 - 10.38246) / 3.115889
replace ses_5 = (ses_5 - 7.074604) / 2.007534
replace ses_6 = (ses_6 - 14.27238) / 4.533772
replace ses_7 = (ses_7 - 10.60815) / 4.682072
replace ses_8 = (ses_8 - 4.082048) / 2.871232
sum ses_1 ses_2 ses_3 ses_4 ses_5 ses_6 ses_7 ses_8, sep(0)

sum ses_students
replace ses_students = (ses_students - 7.025537) / 5.368387
sum ses_students


*Centering moderators

sum efficacy_new
sum general_health_status
sum access_to_services
sum social_close_knit social_help social_friends
same_area_friends

replace efficacy_new = (efficacy_new - 2.12698) / .3401025
replace general_health_status = (general_health_status -
423.6075) / 13.43569
replace access_to_services = (access_to_services - 24.73121) /
11.76732
replace social_close_knit = (social_close_knit - 3.030318) /
.8998611
replace social_help = (social_help - 3.40856) / .8703294
replace social_friends = (social_friends - 5.465213) /
6.277051
replace same_area_friends = (same_area_friends - 3.05566) /
.9089406


*Creating interaction effects
*Efficacy
gen efficacy_age0_4 = efficacy_new*age0_4
gen efficacy_age5_7 = efficacy_new*age5_7
gen efficacy_age8_9 = efficacy_new*age8_9
gen efficacy_age10_14 = efficacy_new*age10_14
gen efficacy_age15 = efficacy_new*age15
```

```
gen efficacy_age16_17 = efficacy_new*age16_17
gen efficacy_age18_19 = efficacy_new*age18_19
gen efficacy_age20_24 = efficacy_new*age20_24
gen efficacy_age25_29 = efficacy_new*age25_29
gen efficacy_age30_44 = efficacy_new*age30_44
gen efficacy_age45_59 = efficacy_new*age45_59
gen efficacy_age60_64 = efficacy_new*age60_64
gen efficacy_age65_74 = efficacy_new*age65_74
gen efficacy_age75_84 = efficacy_new*age75_84
gen efficacy_age85_89 = efficacy_new*age85_89
gen efficacy_age90over = efficacy_new*age90over

gen efficacy_male = efficacy_new*male
gen efficacy_female = efficacy_new*female

gen efficacy_ethnic_white = efficacy_new*ethnic_white
gen efficacy_ethnic_mixed = efficacy_new*ethnic_mixed
gen efficacy_ethnic_asian = efficacy_new*ethnic_asian
gen efficacy_ethnic_black = efficacy_new*ethnic_black
gen efficacy_ethnic_other = efficacy_new*ethnic_other

gen efficacy_country_uk = efficacy_new*country_uk
gen efficacy_country_europe = efficacy_new*country_europe
gen efficacy_country_other = efficacy_new*country_other

gen efficacy_ses_1 = efficacy_new*ses_1
gen efficacy_ses_2 = efficacy_new*ses_2
gen efficacy_ses_3 = efficacy_new*ses_3
gen efficacy_ses_4 = efficacy_new*ses_4
gen efficacy_ses_5 = efficacy_new*ses_5
gen efficacy_ses_6 = efficacy_new*ses_6
gen efficacy_ses_7 = efficacy_new*ses_7
gen efficacy_ses_8 = efficacy_new*ses_8

gen efficacy_ses_students = efficacy_new*ses_students


*general_health_status
gen ghs_age0_4 = general_health_status*age0_4
gen ghs_age5_7 = general_health_status*age5_7
gen ghs_age8_9 = general_health_status*age8_9
gen ghs_age10_14 = general_health_status*age10_14
gen ghs_age15 = general_health_status*age15
gen ghs_age16_17 = general_health_status*age16_17
gen ghs_age18_19 = general_health_status*age18_19
gen ghs_age20_24 = general_health_status*age20_24
gen ghs_age25_29 = general_health_status*age25_29
gen ghs_age30_44 = general_health_status*age30_44
gen ghs_age45_59 = general_health_status*age45_59
gen ghs_age60_64 = general_health_status*age60_64
gen ghs_age65_74 = general_health_status*age65_74
gen ghs_age75_84 = general_health_status*age75_84
```

```
gen ghs_age85_89 = general_health_status*age85_89
gen ghs_age90over = general_health_status*age90over

gen ghs_male = general_health_status*male
gen ghs_female = general_health_status*female

gen ghs_ethnic_white = general_health_status*ethnic_white
gen ghs_ethnic_mixed = general_health_status*ethnic_mixed
gen ghs_ethnic_asian = general_health_status*ethnic_asian
gen ghs_ethnic_black = general_health_status*ethnic_black
gen ghs_ethnic_other = general_health_status*ethnic_other

gen ghs_country_uk = general_health_status*country_uk
gen ghs_country_europe = general_health_status*country_europe
gen ghs_country_other = general_health_status*country_other

gen ghs_ses_1 = general_health_status*ses_1
gen ghs_ses_2 = general_health_status*ses_2
gen ghs_ses_3 = general_health_status*ses_3
gen ghs_ses_4 = general_health_status*ses_4
gen ghs_ses_5 = general_health_status*ses_5
gen ghs_ses_6 = general_health_status*ses_6
gen ghs_ses_7 = general_health_status*ses_7
gen ghs_ses_8 = general_health_status*ses_8

gen ghs_ses_students = general_health_status*ses_students


*access_to_services
gen ats_age0_4 = access_to_services*age0_4
gen ats_age5_7 = access_to_services*age5_7
gen ats_age8_9 = access_to_services*age8_9
gen ats_age10_14 = access_to_services*age10_14
gen ats_age15 = access_to_services*age15
gen ats_age16_17 = access_to_services*age16_17
gen ats_age18_19 = access_to_services*age18_19
gen ats_age20_24 = access_to_services*age20_24
gen ats_age25_29 = access_to_services*age25_29
gen ats_age30_44 = access_to_services*age30_44
gen ats_age45_59 = access_to_services*age45_59
gen ats_age60_64 = access_to_services*age60_64
gen ats_age65_74 = access_to_services*age65_74
gen ats_age75_84 = access_to_services*age75_84
gen ats_age85_89 = access_to_services*age85_89
gen ats_age90over = access_to_services*age90over

gen ats_male = access_to_services*male
gen ats_female = access_to_services*female

gen ats_ethnic_white = access_to_services*ethnic_white
gen ats_ethnic_mixed = access_to_services*ethnic_mixed
gen ats_ethnic_asian = access_to_services*ethnic_asian
```

```
gen ats_ethnic_black = access_to_services*ethnic_black
gen ats_ethnic_other = access_to_services*ethnic_other

gen ats_country_uk = access_to_services*country_uk
gen ats_country_europe = access_to_services*country_europe
gen ats_country_other = access_to_services*country_other

gen ats_ses_1 = access_to_services*ses_1
gen ats_ses_2 = access_to_services*ses_2
gen ats_ses_3 = access_to_services*ses_3
gen ats_ses_4 = access_to_services*ses_4
gen ats_ses_5 = access_to_services*ses_5
gen ats_ses_6 = access_to_services*ses_6
gen ats_ses_7 = access_to_services*ses_7
gen ats_ses_8 = access_to_services*ses_8

gen ats_ses_students = access_to_services*ses_students


*social_close_knit social_help social_friends
same_area_friends
gen sck_age0_4 = social_close_knit*age0_4
gen sck_age5_7 = social_close_knit*age5_7
gen sck_age8_9 = social_close_knit*age8_9
gen sck_age10_14 = social_close_knit*age10_14
gen sck_age15 = social_close_knit*age15
gen sck_age16_17 = social_close_knit*age16_17
gen sck_age18_19 = social_close_knit*age18_19
gen sck_age20_24 = social_close_knit*age20_24
gen sck_age25_29 = social_close_knit*age25_29
gen sck_age30_44 = social_close_knit*age30_44
gen sck_age45_59 = social_close_knit*age45_59
gen sck_age60_64 = social_close_knit*age60_64
gen sck_age65_74 = social_close_knit*age65_74
gen sck_age75_84 = social_close_knit*age75_84
gen sck_age85_89 = social_close_knit*age85_89
gen sck_age90over = social_close_knit*age90over

gen sck_male = social_close_knit*male
gen sck_female = social_close_knit*female

gen sck_ethnic_white = social_close_knit*ethnic_white
gen sck_ethnic_mixed = social_close_knit*ethnic_mixed
gen sck_ethnic_asian = social_close_knit*ethnic_asian
gen sck_ethnic_black = social_close_knit*ethnic_black
gen sck_ethnic_other = social_close_knit*ethnic_other

gen sck_country_uk = social_close_knit*country_uk
gen sck_country_europe = social_close_knit*country_europe
gen sck_country_other = social_close_knit*country_other

gen sck_ses_1 = social_close_knit*ses_1
```

```
gen sck_ses_2 = social_close_knit*ses_2
gen sck_ses_3 = social_close_knit*ses_3
gen sck_ses_4 = social_close_knit*ses_4
gen sck_ses_5 = social_close_knit*ses_5
gen sck_ses_6 = social_close_knit*ses_6
gen sck_ses_7 = social_close_knit*ses_7
gen sck_ses_8 = social_close_knit*ses_8

gen sck_ses_students = social_close_knit*ses_students

gen social_help_age0_4 = social_help*age0_4
gen social_help_age5_7 = social_help*age5_7
gen social_help_age8_9 = social_help*age8_9
gen social_help_age10_14 = social_help*age10_14
gen social_help_age15 = social_help*age15
gen social_help_age16_17 = social_help*age16_17
gen social_help_age18_19 = social_help*age18_19
gen social_help_age20_24 = social_help*age20_24
gen social_help_age25_29 = social_help*age25_29
gen social_help_age30_44 = social_help*age30_44
gen social_help_age45_59 = social_help*age45_59
gen social_help_age60_64 = social_help*age60_64
gen social_help_age65_74 = social_help*age65_74
gen social_help_age75_84 = social_help*age75_84
gen social_help_age85_89 = social_help*age85_89
gen social_help_age90over = social_help*age90over

gen social_help_male = social_help*male
gen social_help_female = social_help*female

gen social_help_ethnic_white = social_help*ethnic_white
gen social_help_ethnic_mixed = social_help*ethnic_mixed
gen social_help_ethnic_asian = social_help*ethnic_asian
gen social_help_ethnic_black = social_help*ethnic_black
gen social_help_ethnic_other = social_help*ethnic_other

gen social_help_country_uk = social_help*country_uk
gen social_help_country_europe = social_help*country_europe
gen social_help_country_other = social_help*country_other

gen social_help_country_ses_1 = social_help*ses_1
gen social_help_country_ses_2 = social_help*ses_2
gen social_help_country_ses_3 = social_help*ses_3
gen social_help_country_ses_4 = social_help*ses_4
gen social_help_country_ses_5 = social_help*ses_5
gen social_help_country_ses_6 = social_help*ses_6
gen social_help_country_ses_7 = social_help*ses_7
gen social_help_country_ses_8 = social_help*ses_8

gen social_help_ses_students = social_help*ses_students
```

```
gen social_friends_age0_4 = social_friends*age0_4
gen social_friends_age5_7 = social_friends*age5_7
gen social_friends_age8_9 = social_friends*age8_9
gen social_friends_age10_14 = social_friends*age10_14
gen social_friends_age15 = social_friends*age15
gen social_friends_age16_17 = social_friends*age16_17
gen social_friends_age18_19 = social_friends*age18_19
gen social_friends_age20_24 = social_friends*age20_24
gen social_friends_age25_29 = social_friends*age25_29
gen social_friends_age30_44 = social_friends*age30_44
gen social_friends_age45_59 = social_friends*age45_59
gen social_friends_age60_64 = social_friends*age60_64
gen social_friends_age65_74 = social_friends*age65_74
gen social_friends_age75_84 = social_friends*age75_84
gen social_friends_age85_89 = social_friends*age85_89
gen social_friends_age90over = social_friends*age90over

gen social_friends_male = social_friends*male
gen social_friends_female = social_friends*female

gen social_friends_ethnic_white = social_friends*ethnic_white
gen social_friends_ethnic_mixed = social_friends*ethnic_mixed
gen social_friends_ethnic_asian = social_friends*ethnic_asian
gen social_friends_ethnic_black = social_friends*ethnic_black
gen social_friends_ethnic_other = social_friends*ethnic_other

gen social_friends_country_uk = social_friends*country_uk
gen social_friends_country_europe =
social_friends*country_europe
gen social_friends_country_other =
social_friends*country_other

gen social_friends_country_ses_1 = social_friends*ses_1
gen social_friends_country_ses_2 = social_friends*ses_2
gen social_friends_country_ses_3 = social_friends*ses_3
gen social_friends_country_ses_4 = social_friends*ses_4
gen social_friends_country_ses_5 = social_friends*ses_5
gen social_friends_country_ses_6 = social_friends*ses_6
gen social_friends_country_ses_7 = social_friends*ses_7
gen social_friends_country_ses_8 = social_friends*ses_8

gen social_friends_ses_students = social_friends*ses_students

gen same_area_friends_age0_4 = same_area_friends*age0_4
gen same_area_friends_age5_7 = same_area_friends*age5_7
gen same_area_friends_age8_9 = same_area_friends*age8_9
gen same_area_friends_age10_14 = same_area_friends*age10_14
gen same_area_friends_age15 = same_area_friends*age15
gen same_area_friends_age16_17 = same_area_friends*age16_17
gen same_area_friends_age18_19 = same_area_friends*age18_19
gen same_area_friends_age20_24 = same_area_friends*age20_24
```

```
gen same_area_friends_age25_29 = same_area_friends*age25_29
gen same_area_friends_age30_44 = same_area_friends*age30_44
gen same_area_friends_age45_59 = same_area_friends*age45_59
gen same_area_friends_age60_64 = same_area_friends*age60_64
gen same_area_friends_age65_74 = same_area_friends*age65_74
gen same_area_friends_age75_84 = same_area_friends*age75_84
gen same_area_friends_age85_89 = same_area_friends*age85_89
gen same_area_friends_age90over = same_area_friends*age90over

gen same_area_friends_male = same_area_friends*male
gen same_area_friends_female = same_area_friends*female

gen same_area_friends_ethnic_white =
same_area_friends*ethnic_white
gen same_area_friends_ethnic_mixed =
same_area_friends*ethnic_mixed
gen same_area_friends_ethnic_asian =
same_area_friends*ethnic_asian
gen same_area_friends_ethnic_black =
same_area_friends*ethnic_black
gen same_area_friends_ethnic_other =
same_area_friends*ethnic_other

gen same_area_friends_country_uk =
same_area_friends*country_uk
gen same_area_friends_country_europe =
same_area_friends*country_europe
gen same_area_friends_country_other =
same_area_friends*country_other

gen same_area_friends_ses_1 = same_area_friends*ses_1
gen same_area_friends_ses_2 = same_area_friends*ses_2
gen same_area_friends_ses_3 = same_area_friends*ses_3
gen same_area_friends_ses_4 = same_area_friends*ses_4
gen same_area_friends_ses_5 = same_area_friends*ses_5
gen same_area_friends_ses_6 = same_area_friends*ses_6
gen same_area_friends_ses_7 = same_area_friends*ses_7
gen same_area_friends_ses_8 = same_area_friends*ses_8

gen same_area_friends_ses_students =
same_area_friends*ses_students

* GENERATE 3 CLASS SES MODEL

gen class1 = (ses_1 + ses_2)
gen class2 = (ses_3 + ses_4)
gen class3 = (ses_5 + ses_6 + ses_7)

*Creating interaction effects with new SES class
sum class1-class3
replace class1 = (class1-0)/.9526618
replace class2 = (class2-0)/.7302451
```

```
replace class3 = (class3-0)/.9251948
sum class1-class3

gen efficacy_class1 = efficacy_new*class1
gen efficacy_class2 = efficacy_new*class2
gen efficacy_class3 = efficacy_new*class3

gen ghs_class1 = general_health_status*class1
gen ghs_class2 = general_health_status*class2
gen ghs_class3 = general_health_status*class3

gen ats_class1 = access_to_services*class1
gen ats_class2 = access_to_services*class2
gen ats_class3 = access_to_services*class3

gen sck_class1 = social_close_knit*class1
gen sck_class2 = social_close_knit*class2
gen sck_class3 = social_close_knit*class3

gen social_help_class1 = social_help*class1
gen social_help_class2 = social_help*class2
gen social_help_class3 = social_help*class3

gen social_friends_class1 = social_friends*class1
gen social_friends_class2 = social_friends*class2
gen social_friends_class3 = social_friends*class3

gen same_area_friends_class1 = same_area_friends*class1
gen same_area_friends_class2 = same_area_friends*class2
gen same_area_friends_class3 = same_area_friends*class3


*Regressions with Efficacy
*Comparisons: Female, Age 20-24, White, UK, SES of 1
regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students efficacy_new efficacy_age0_4
efficacy_age5_7 efficacy_age8_9 efficacy_age10_14
efficacy_age15 efficacy_age16_17 efficacy_age18_19
efficacy_age20_24 efficacy_age25_29 efficacy_age45_59
efficacy_age60_64 efficacy_age65_74 efficacy_age75_84
efficacy_age85_89 efficacy_age90over efficacy_male
efficacy_ethnic_mixed efficacy_ethnic_asian
efficacy_ethnic_black efficacy_ethnic_other
efficacy_country_europe efficacy_country_other efficacy_class1
efficacy_class2 efficacy_class3 efficacy_ses_students
efficacy_ses_8, b
regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
```

```
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students efficacy_new efficacy_age0_4
efficacy_age5_7 efficacy_age8_9 efficacy_age10_14
efficacy_age15 efficacy_age16_17 efficacy_age18_19
efficacy_age20_24 efficacy_age25_29 efficacy_age45_59
efficacy_age60_64 efficacy_age65_74 efficacy_age75_84
efficacy_age85_89 efficacy_age90over efficacy_male
efficacy_ethnic_mixed efficacy_ethnic_asian
efficacy_ethnic_black efficacy_ethnic_other
efficacy_country_europe efficacy_country_other efficacy_class1
efficacy_class2 efficacy_class3 efficacy_ses_students
efficacy_ses_8, b
regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students efficacy_new efficacy_age0_4
efficacy_age5_7 efficacy_age8_9 efficacy_age10_14
efficacy_age15 efficacy_age16_17 efficacy_age18_19
efficacy_age20_24 efficacy_age25_29 efficacy_age45_59
efficacy_age60_64 efficacy_age65_74 efficacy_age75_84
efficacy_age85_89 efficacy_age90over efficacy_male
efficacy_ethnic_mixed efficacy_ethnic_asian
efficacy_ethnic_black efficacy_ethnic_other
efficacy_country_europe efficacy_country_other efficacy_class1
efficacy_class2 efficacy_class3 efficacy_ses_students
efficacy_ses_8, b
regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students efficacy_new efficacy_age0_4
efficacy_age5_7 efficacy_age8_9 efficacy_age10_14
efficacy_age15 efficacy_age16_17 efficacy_age18_19
efficacy_age20_24 efficacy_age25_29 efficacy_age45_59
efficacy_age60_64 efficacy_age65_74 efficacy_age75_84
efficacy_age85_89 efficacy_age90over efficacy_male
efficacy_ethnic_mixed efficacy_ethnic_asian
efficacy_ethnic_black efficacy_ethnic_other
efficacy_country_europe efficacy_country_other efficacy_class1
efficacy_class2 efficacy_class3 efficacy_ses_students
efficacy_ses_8, b

*Regressions with General health status
regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students general_health_status
ghs_age0_4 ghs_age5_7 ghs_age8_9 ghs_age10_14 ghs_age15
ghs_age16_17 ghs_age18_19 ghs_age20_24 ghs_age25_29
ghs_age45_59 ghs_age60_64 ghs_age65_74 ghs_age75_84
```

```
ghs_age85_89 ghs_age90over ghs_male ghs_ethnic_mixed
ghs_ethnic_asian ghs_ethnic_black ghs_ethnic_other
ghs_country_europe ghs_country_other ghs_class1 ghs_class2
ghs_class3 ghs_ses_students ghs_ses_8, b
regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students general_health_status
ghs_age0_4 ghs_age5_7 ghs_age8_9 ghs_age10_14 ghs_age15
ghs_age16_17 ghs_age18_19 ghs_age20_24 ghs_age25_29
ghs_age45_59 ghs_age60_64 ghs_age65_74 ghs_age75_84
ghs_age85_89 ghs_age90over ghs_male ghs_ethnic_mixed
ghs_ethnic_asian ghs_ethnic_black ghs_ethnic_other
ghs_country_europe ghs_country_other ghs_class1 ghs_class2
ghs_class3 ghs_ses_students ghs_ses_8, b
regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students general_health_status
ghs_age0_4 ghs_age5_7 ghs_age8_9 ghs_age10_14 ghs_age15
ghs_age16_17 ghs_age18_19 ghs_age20_24 ghs_age25_29
ghs_age45_59 ghs_age60_64 ghs_age65_74 ghs_age75_84
ghs_age85_89 ghs_age90over ghs_male ghs_ethnic_mixed
ghs_ethnic_asian ghs_ethnic_black ghs_ethnic_other
ghs_country_europe ghs_country_other ghs_class1 ghs_class2
ghs_class3 ghs_ses_students ghs_ses_8, b
regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students general_health_status
ghs_age0_4 ghs_age5_7 ghs_age8_9 ghs_age10_14 ghs_age15
ghs_age16_17 ghs_age18_19 ghs_age20_24 ghs_age25_29
ghs_age45_59 ghs_age60_64 ghs_age65_74 ghs_age75_84
ghs_age85_89 ghs_age90over ghs_male ghs_ethnic_mixed
ghs_ethnic_asian ghs_ethnic_black ghs_ethnic_other
ghs_country_europe ghs_country_other ghs_class1 ghs_class2
ghs_class3 ghs_ses_students ghs_ses_8, b

*Regressions with Access to services
regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students access_to_services ats_age0_4
ats_age5_7 ats_age8_9 ats_age10_14 ats_age15 ats_age16_17
ats_age18_19 ats_age20_24 ats_age25_29 ats_age45_59
ats_age60_64 ats_age65_74 ats_age75_84 ats_age85_89
ats_age90over ats_male ats_ethnic_mixed ats_ethnic_asian
ats_ethnic_black ats_ethnic_other ats_country_europe
```

```
ats_country_other ats_class1 ats_class2 ats_class3
ats_ses_students ats_ses_8, b
regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students access_to_services ats_age0_4
ats_age5_7 ats_age8_9 ats_age10_14 ats_age15 ats_age16_17
ats_age18_19 ats_age20_24 ats_age25_29 ats_age45_59
ats_age60_64 ats_age65_74 ats_age75_84 ats_age85_89
ats_age90over ats_male ats_ethnic_mixed ats_ethnic_asian
ats_ethnic_black ats_ethnic_other ats_country_europe
ats_country_other ats_class1 ats_class2 ats_class3
ats_ses_students ats_ses_8, b
regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students access_to_services ats_age0_4
ats_age5_7 ats_age8_9 ats_age10_14 ats_age15 ats_age16_17
ats_age18_19 ats_age20_24 ats_age25_29 ats_age45_59
ats_age60_64 ats_age65_74 ats_age75_84 ats_age85_89
ats_age90over ats_male ats_ethnic_mixed ats_ethnic_asian
ats_ethnic_black ats_ethnic_other ats_country_europe
ats_country_other ats_class1 ats_class2 ats_class3
ats_ses_students ats_ses_8, b
regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students access_to_services ats_age0_4
ats_age5_7 ats_age8_9 ats_age10_14 ats_age15 ats_age16_17
ats_age18_19 ats_age20_24 ats_age25_29 ats_age45_59
ats_age60_64 ats_age65_74 ats_age75_84 ats_age85_89
ats_age90over ats_male ats_ethnic_mixed ats_ethnic_asian
ats_ethnic_black ats_ethnic_other ats_country_europe
ats_country_other ats_class1 ats_class2 ats_class3
ats_ses_students ats_ses_8, b

*Regressions with social measures: Separately
*social_close_knit social_help social_friends
same_area_friends
regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_close_knit sck_age0_4
sck_age5_7 sck_age8_9 sck_age10_14 sck_age15 sck_age16_17
sck_age18_19 sck_age20_24 sck_age25_29 sck_age45_59
sck_age60_64 sck_age65_74 sck_age75_84 sck_age85_89
sck_age90over sck_male sck_ethnic_mixed sck_ethnic_asian
sck_ethnic_black sck_ethnic_other sck_country_europe
```

```
sck_country_other sck_class1 sck_class2 sck_class3
sck_ses_students sck_ses_8, b
regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_close_knit sck_age0_4
sck_age5_7 sck_age8_9 sck_age10_14 sck_age15 sck_age16_17
sck_age18_19 sck_age20_24 sck_age25_29 sck_age45_59
sck_age60_64 sck_age65_74 sck_age75_84 sck_age85_89
sck_age90over sck_male sck_ethnic_mixed sck_ethnic_asian
sck_ethnic_black sck_ethnic_other sck_country_europe
sck_country_other sck_class1 sck_class2 sck_class3
sck_ses_students sck_ses_8, b
regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_close_knit sck_age0_4
sck_age5_7 sck_age8_9 sck_age10_14 sck_age15 sck_age16_17
sck_age18_19 sck_age20_24 sck_age25_29 sck_age45_59
sck_age60_64 sck_age65_74 sck_age75_84 sck_age85_89
sck_age90over sck_male sck_ethnic_mixed sck_ethnic_asian
sck_ethnic_black sck_ethnic_other sck_country_europe
sck_country_other sck_class1 sck_class2 sck_class3
sck_ses_students sck_ses_8, b
regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_close_knit sck_age0_4
sck_age5_7 sck_age8_9 sck_age10_14 sck_age15 sck_age16_17
sck_age18_19 sck_age20_24 sck_age25_29 sck_age45_59
sck_age60_64 sck_age65_74 sck_age75_84 sck_age85_89
sck_age90over sck_male sck_ethnic_mixed sck_ethnic_asian
sck_ethnic_black sck_ethnic_other sck_country_europe
sck_country_other sck_class1 sck_class2 sck_class3
sck_ses_students sck_ses_8, b

regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_help
social_help_age0_4 social_help_age5_7 social_help_age8_9
social_help_age10_14 social_help_age15 social_help_age16_17
social_help_age18_19 social_help_age20_24 social_help_age25_29
social_help_age45_59 social_help_age60_64 social_help_age65_74
social_help_age75_84 social_help_age85_89
social_help_age90over social_help_male
social_help_ethnic_mixed social_help_ethnic_asian
social_help_ethnic_black social_help_ethnic_other
```

```
social_help_country_europe social_help_country_other
social_help_class1 social_help_class2 social_help_class3
social_help_ses_students social_help_country_ses_8, b
regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_help
social_help_age0_4 social_help_age5_7 social_help_age8_9
social_help_age10_14 social_help_age15 social_help_age16_17
social_help_age18_19 social_help_age20_24 social_help_age25_29
social_help_age45_59 social_help_age60_64 social_help_age65_74
social_help_age75_84 social_help_age85_89
social_help_age90over social_help_male
social_help_ethnic_mixed social_help_ethnic_asian
social_help_ethnic_black social_help_ethnic_other
social_help_country_europe social_help_country_other
social_help_class1 social_help_class2 social_help_class3
social_help_ses_students social_help_country_ses_8, b
regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_help
social_help_age0_4 social_help_age5_7 social_help_age8_9
social_help_age10_14 social_help_age15 social_help_age16_17
social_help_age18_19 social_help_age20_24 social_help_age25_29
social_help_age45_59 social_help_age60_64 social_help_age65_74
social_help_age75_84 social_help_age85_89
social_help_age90over social_help_male
social_help_ethnic_mixed social_help_ethnic_asian
social_help_ethnic_black social_help_ethnic_other
social_help_country_europe social_help_country_other
social_help_class1 social_help_class2 social_help_class3
social_help_ses_students social_help_country_ses_8, b
regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_help
social_help_age0_4 social_help_age5_7 social_help_age8_9
social_help_age10_14 social_help_age15 social_help_age16_17
social_help_age18_19 social_help_age20_24 social_help_age25_29
social_help_age45_59 social_help_age60_64 social_help_age65_74
social_help_age75_84 social_help_age85_89
social_help_age90over social_help_male
social_help_ethnic_mixed social_help_ethnic_asian
social_help_ethnic_black social_help_ethnic_other
social_help_country_europe social_help_country_other
social_help_class1 social_help_class2 social_help_class3
social_help_ses_students social_help_country_ses_8, b
```

```
regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_friends
social_friends_age0_4 social_friends_age5_7
social_friends_age8_9 social_friends_age10_14
social_friends_age15 social_friends_age16_17
social_friends_age18_19 social_friends_age20_24
social_friends_age25_29 social_friends_age45_59
social_friends_age60_64 social_friends_age65_74
social_friends_age75_84 social_friends_age85_89
social_friends_age90over social_friends_male
social_friends_ethnic_mixed social_friends_ethnic_asian
social_friends_ethnic_black social_friends_ethnic_other
social_friends_country_europe social_friends_country_other
social_friends_class1 social_friends_class2
social_friends_class3 social_friends_ses_students
social_friends_country_ses_8, b
regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_friends
social_friends_age0_4 social_friends_age5_7
social_friends_age8_9 social_friends_age10_14
social_friends_age15 social_friends_age16_17
social_friends_age18_19 social_friends_age20_24
social_friends_age25_29 social_friends_age45_59
social_friends_age60_64 social_friends_age65_74
social_friends_age75_84 social_friends_age85_89
social_friends_age90over social_friends_male
social_friends_ethnic_mixed social_friends_ethnic_asian
social_friends_ethnic_black social_friends_ethnic_other
social_friends_country_europe social_friends_country_other
social_friends_class1 social_friends_class2
social_friends_class3 social_friends_ses_students
social_friends_country_ses_8, b
regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_friends
social_friends_age0_4 social_friends_age5_7
social_friends_age8_9 social_friends_age10_14
social_friends_age15 social_friends_age16_17
social_friends_age18_19 social_friends_age20_24
social_friends_age25_29 social_friends_age45_59
social_friends_age60_64 social_friends_age65_74
social_friends_age75_84 social_friends_age85_89
social_friends_age90over social_friends_male
social_friends_ethnic_mixed social_friends_ethnic_asian
```

```
social_friends_ethnic_black social_friends_ethnic_other
social_friends_country_europe social_friends_country_other
social_friends_class1 social_friends_class2
social_friends_class3 social_friends_ses_students
social_friends_country_ses_8, b
regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students social_friends
social_friends_age0_4 social_friends_age5_7
social_friends_age8_9 social_friends_age10_14
social_friends_age15 social_friends_age16_17
social_friends_age18_19 social_friends_age20_24
social_friends_age25_29 social_friends_age45_59
social_friends_age60_64 social_friends_age65_74
social_friends_age75_84 social_friends_age85_89
social_friends_age90over social_friends_male
social_friends_ethnic_mixed social_friends_ethnic_asian
social_friends_ethnic_black social_friends_ethnic_other
social_friends_country_europe social_friends_country_other
social_friends_class1 social_friends_class2
social_friends_class3 social_friends_ses_students
social_friends_country_ses_8, b

regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students same_area_friends
same_area_friends_age0_4 same_area_friends_age5_7
same_area_friends_age8_9 same_area_friends_age10_14
same_area_friends_age15 same_area_friends_age16_17
same_area_friends_age18_19 same_area_friends_age20_24
same_area_friends_age25_29 same_area_friends_age45_59
same_area_friends_age60_64 same_area_friends_age65_74
same_area_friends_age75_84 same_area_friends_age85_89
same_area_friends_age90over same_area_friends_male
same_area_friends_ethnic_mixed same_area_friends_ethnic_asian
same_area_friends_ethnic_black same_area_friends_ethnic_other
same_area_friends_country_europe
same_area_friends_country_other same_area_friends_class1
same_area_friends_class2 same_area_friends_class3
same_area_friends_ses_students same_area_friends_ses_8, b
regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students same_area_friends
same_area_friends_age0_4 same_area_friends_age5_7
same_area_friends_age8_9 same_area_friends_age10_14
same_area_friends_age15 same_area_friends_age16_17
```

```
same_area_friends_age18_19 same_area_friends_age20_24
same_area_friends_age25_29 same_area_friends_age45_59
same_area_friends_age60_64 same_area_friends_age65_74
same_area_friends_age75_84 same_area_friends_age85_89
same_area_friends_age90over same_area_friends_male
same_area_friends_ethnic_mixed same_area_friends_ethnic_asian
same_area_friends_ethnic_black same_area_friends_ethnic_other
same_area_friends_country_europe
same_area_friends_country_other same_area_friends_class1
same_area_friends_class2 same_area_friends_class3
same_area_friends_ses_students same_area_friends_ses_8, b
regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students same_area_friends
same_area_friends_age0_4 same_area_friends_age5_7
same_area_friends_age8_9 same_area_friends_age10_14
same_area_friends_age15 same_area_friends_age16_17
same_area_friends_age18_19 same_area_friends_age20_24
same_area_friends_age25_29 same_area_friends_age45_59
same_area_friends_age60_64 same_area_friends_age65_74
same_area_friends_age75_84 same_area_friends_age85_89
same_area_friends_age90over same_area_friends_male
same_area_friends_ethnic_mixed same_area_friends_ethnic_asian
same_area_friends_ethnic_black same_area_friends_ethnic_other
same_area_friends_country_europe
same_area_friends_country_other same_area_friends_class1
same_area_friends_class2 same_area_friends_class3
same_area_friends_ses_students same_area_friends_ses_8, b
regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students same_area_friends
same_area_friends_age0_4 same_area_friends_age5_7
same_area_friends_age8_9 same_area_friends_age10_14
same_area_friends_age15 same_area_friends_age16_17
same_area_friends_age18_19 same_area_friends_age20_24
same_area_friends_age25_29 same_area_friends_age45_59
same_area_friends_age60_64 same_area_friends_age65_74
same_area_friends_age75_84 same_area_friends_age85_89
same_area_friends_age90over same_area_friends_male
same_area_friends_ethnic_mixed same_area_friends_ethnic_asian
same_area_friends_ethnic_black same_area_friends_ethnic_other
same_area_friends_country_europe
same_area_friends_country_other same_area_friends_class1
same_area_friends_class2 same_area_friends_class3
same_area_friends_ses_students same_area_friends_ses_8, b

*Model with ONLY demographics
```

```
regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students, b
regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students, b
regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students, b
regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15
age16_17 age18_19 age20_24 age25_29 age45_59 age60_64 age65_74
age75_84 age85_89 age90over male ethnic_mixed ethnic_asian
ethnic_black ethnic_other country_europe country_other class1
class2 class3 ses_8 ses_students, b

capture log close
```

Appendix H

Model Testing Output (Stata)

```
. .
. *Comparisons: Female, Age 30-45, White, UK

. *Socio-demographics only model

. regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_asian ethnic_black ethnic_other
country_europe country_other class1 class2 class3 ses_8 ses_students, b

      Source |       SS           df       MS      Number of obs   =     3,610
-------------+----------------------------------   F(27, 3582)     =     44.81
       Model |  1127.87613        27  41.7731901   Prob > F        =    0.0000
    Residual |  3339.17069     3,582  .932208456   R-squared       =    0.2525
-------------+----------------------------------   Adj R-squared   =    0.2469
       Total |  4467.04682     3,609  1.23775196   Root MSE        =    .96551

------------------------------------------------------------------------------
s_total_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
      age0_4 |  -.1608407   .0410004    -3.92   0.000                -.1440257
      age5_7 |   -.046901     .03033    -1.55   0.122                -.0421309
      age8_9 |  -.0761741   .0259645    -2.93   0.003                 -.068469
    age10_14 |  -.1037803   .0315633    -3.29   0.001                -.0932386
       age15 |  -.0064037   .0217215    -0.29   0.768                 -.005751
    age16_17 |  -.0479249   .0236202    -2.03   0.043                -.0430836
    age18_19 |  -.2021777   .0301125    -6.71   0.000                -.1817752
    age20_24 |  -.1055341   .0474807    -2.22   0.026                -.0948882
    age25_29 |  -.1020002    .052317    -1.95   0.051                -.0915919
    age45_59 |   -.080922   .0371496    -2.18   0.029                -.0726353
    age60_64 |  -.0794376      .0381    -2.08   0.037                -.0713579
    age65_74 |  -.0594031   .0486823    -1.22   0.222                -.0533845
    age75_84 |   .0157148   .0428431     0.37   0.714                 .0141233
    age85_89 |    .074274   .0370639     2.00   0.045                 .0667636
   age90over |   .1270087   .0286599     4.43   0.000                 .1142001
        male |  -.0589252   .0209389    -2.81   0.005                -.0529223
ethnic_mixed |   .0913216   .0257441     3.55   0.000                 .0820391
ethnic_asian |  -.1027238   .0380198    -2.70   0.007                -.0923769
ethnic_black |   .0784504   .0260036     3.02   0.003                  .070544
ethnic_other |  -.0804287   .0238109    -3.38   0.001                -.0722498
country_europe |   .0493662   .0245492     2.01   0.044                 .0442821
country_other |   -.018186   .0481534    -0.38   0.706                -.0163531
      class1 |  -.2481847   .0943974    -2.63   0.009                -.4456779
      class2 |  -.0261831   .0396935    -0.66   0.510                  -.04704
      class3 |  -.1319606   .0593803    -2.22   0.026                 -.355557
       ses_8 |   .3100578   .0693305     4.47   0.000                 .2780995
ses_students |   .0305397   .1067126     0.29   0.775                 .0274641
       _cons |  -.0267189   .0160697    -1.66   0.096                        .
------------------------------------------------------------------------------

. regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_asian ethnic_black ethnic_other
country_europe country_other class1 class2 class3 ses_8 ses_students, b

      Source |       SS           df       MS      Number of obs   =     3,610
-------------+----------------------------------   F(27, 3582)     =     40.11
       Model |  992.868987        27  36.7729255   Prob > F        =    0.0000
    Residual |  3284.07097     3,582  .916826065   R-squared       =    0.2321
-------------+----------------------------------   Adj R-squared   =    0.2264
       Total |  4276.93995     3,609  1.18507619   Root MSE        =    .95751

------------------------------------------------------------------------------
 s_high_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
      age0_4 |  -.1426122   .0406607    -3.51   0.000                -.1305102
      age5_7 |  -.0478472   .0300787    -1.59   0.112                -.0439257
      age8_9 |  -.0675445   .0257494    -2.62   0.009                 -.062047
    age10_14 |  -.1020035   .0313019    -3.26   0.001                -.0936568
       age15 |   .0032981   .0215415     0.15   0.878                 .0030271
    age16_17 |  -.0620793   .0234245    -2.65   0.008                -.0570349
    age18_19 |  -.1966456    .029863    -6.58   0.000                 -.180688
    age20_24 |  -.1288647   .0470873    -2.74   0.006                -.1184123
    age25_29 |  -.1143954   .0518836    -2.20   0.028                -.1049804
    age45_59 |  -.0501811   .0368419    -1.36   0.173                -.0460325
    age60_64 |  -.0876822   .0377844    -2.32   0.020                -.0804954
    age65_74 |  -.0653256    .048279    -1.35   0.176                -.0599974
    age75_84 |  -.0061257   .0424882    -0.14   0.885                -.0056263
    age85_89 |   .0423379   .0367569     1.15   0.249                 .0388934
   age90over |   .1159087   .0284224     4.08   0.000                 .1065106
        male |  -.0516942   .0207655    -2.49   0.013                -.0474485
ethnic_mixed |   .1368326   .0255308     5.36   0.000                 .1256263
ethnic_asian |  -.0009597   .0377048    -0.03   0.980                 -.000882
ethnic_black |   .1281522   .0257882     4.97   0.000                 .1177701
ethnic_other |  -.0652495   .0236136    -2.76   0.006                -.0599026
country_europe |   .0233557   .0243458     0.96   0.337                 .0214109
country_other |  -.0988166   .0477545    -2.07   0.039                -.0908103
      class1 |  -.1695661   .0936153    -1.81   0.070                -.3111923
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       class2 |   .0009177   .0393646     0.02   0.981                 .0016849
       class3 |  -.0789623   .0588883    -1.34   0.180                -.2174347
        ses_8 |   .3296996   .0687561     4.80   0.000                 .3022175
 ses_students |   .1221057   .1058285     1.15   0.249                 .1122225
        _cons |  -.0184439   .0159365    -1.16   0.247                        .
------------------------------------------------------------------------------

. regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_asian ethnic_black ethnic_other
country_europe country_other class1 class2 class3 ses_8 ses_students, b

      Source |       SS           df       MS      Number of obs   =     3,540
-------------+----------------------------------   F(27, 3512)     =     41.07
       Model |  1140.00936        27  42.2225688   Prob > F        =    0.0000
    Residual |  3610.62671     3,512  1.02808278   R-squared       =    0.2400
-------------+----------------------------------   Adj R-squared   =    0.2341
       Total |  4750.63607     3,539  1.34236679   Root MSE        =    1.0139

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s_medium_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
--------------+---------------------------------------------------------------
       age0_4 |  -.1694842   .0437894    -3.87   0.000                -.1444266
       age5_7 |  -.0612937   .0321092    -1.91   0.056                -.0528052
       age8_9 |  -.0609284   .0276433    -2.20   0.028                -.0525706
     age10_14 |  -.0903962   .0335643    -2.69   0.007                -.0778967
        age15 |  -.0041851    .023077    -0.18   0.856                -.0036073
     age16_17 |  -.0539293    .025046    -2.15   0.031                -.0466362
     age18_19 |  -.1896818   .0319481    -5.94   0.000                 -.164165
     age20_24 |  -.1311055   .0508987    -2.58   0.010                -.1132459
     age25_29 |   -.038988   .0561007    -0.69   0.487                -.0333541
     age45_59 |  -.0866875    .039341    -2.20   0.028                 -.074253
     age60_64 |  -.0978025   .0403902    -2.42   0.016                -.0840362
     age65_74 |   .0001391   .0518213     0.00   0.998                 .0001195
     age75_84 |  -.0403328   .0455338    -0.89   0.376                -.0347123
     age85_89 |   .0761455   .0392249     1.94   0.052                 .0656799
    age90over |   .1666974   .0303464     5.49   0.000                 .1439123
         male |  -.0418603   .0221997    -1.89   0.059                -.0360775
 ethnic_mixed |   .0718329   .0272521     2.64   0.008                 .0620073
 ethnic_asian |   -.153761   .0405371    -3.79   0.000                -.1337323
 ethnic_black |   .0344598   .0275088     1.25   0.210                 .0299515
 ethnic_other |  -.0635135   .0261051    -2.43   0.015                -.0534318
country_europe |   .0327285   .0261954     1.25   0.212                 .0282048
 country_other |  -.0029614   .0515424    -0.06   0.954                -.0025582
       class1 |  -.3009403   .1004291    -3.00   0.003                -.5192324
       class2 |  -.0542966   .0422414    -1.29   0.199                -.0938178
       class3 |   -.158833   .0631202    -2.52   0.012                -.4106988
        ses_8 |    .295489   .0737166     4.01   0.000                 .2550316
 ses_students |  -.0132858   .1132616    -0.12   0.907                 -.011499
        _cons |  -.0081304   .0170472    -0.48   0.633                        .
------------------------------------------------------------------------------

. regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_asian ethnic_black ethnic_other
country_europe country_other class1 class2 class3 ses_8 ses_students, b

      Source |       SS           df       MS      Number of obs   =     3,610
-------------+----------------------------------   F(27, 3582)     =     46.21
       Model |  1007.01481        27  37.2968448   Prob > F        =    0.0000
    Residual |  2891.17218     3,582  .807139078   R-squared       =    0.2583
-------------+----------------------------------   Adj R-squared   =    0.2527
       Total |  3898.18699     3,609   1.0801294   Root MSE        =    .89841

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  s_low_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
       age0_4 |  -.1218017    .038151    -3.19   0.001                -.1167553
       age5_7 |   -.045881   .0282221    -1.63   0.104                -.0441194
       age8_9 |  -.0579731   .0241601    -2.40   0.016                -.0557818
     age10_14 |  -.0949491   .0293698    -3.23   0.001                -.0913167
        age15 |  -.0229453   .0202119    -1.14   0.256                -.0220588
     age16_17 |  -.0120799   .0219786    -0.55   0.583                 -.011625
     age18_19 |  -.1663947   .0280198    -5.94   0.000                -.1601474
     age20_24 |  -.0474619   .0441809    -1.07   0.283                -.0456818
     age25_29 |  -.1076565   .0486811    -2.21   0.027                -.1034845
     age45_59 |  -.1152495   .0345678    -3.33   0.001                -.1107386
     age60_64 |  -.0781459   .0354522    -2.20   0.028                -.0751452
     age65_74 |  -.0778825    .045299    -1.72   0.086                -.0749246
     age75_84 |    .055476   .0398656     1.39   0.164                 .0533716
     age85_89 |   .1003458   .0344881     2.91   0.004                 .0965564
    age90over |   .1090122   .0266681     4.09   0.000                  .104927
         male |  -.0758278   .0194837    -3.89   0.000                -.0729029
 ethnic_mixed |   .0195586    .023955     0.82   0.414                  .018809
 ethnic_asian |  -.1222811   .0353775    -3.46   0.001                -.1177146
 ethnic_black |   .0578559   .0241965     2.39   0.017                 .0556919
 ethnic_other |  -.0580313   .0221561    -2.62   0.009                -.0558041
country_europe |   .0419195   .0228431     1.84   0.067                 .0402525
 country_other |   -.001301   .0448069    -0.03   0.977                -.0012523
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      class1 |  -.2717964    .087837    -3.09   0.002               -.5224787
      class2 |  -.0325908   .0369349    -0.88   0.378               -.0626788
      class3 |  -.1500228   .0552535    -2.72   0.007               -.4327143
       ses_8 |   .2291584   .0645122     3.55   0.000                .2200251
ses_students |  -.0724982   .0992963    -0.73   0.465               -.0697922
       _cons |  -.0092303   .0149529    -0.62   0.537                       .
--------------------------------------------------------------------------------

. *Regressions with Efficacy

. regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_
> asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
efficacy_new efficacy_age0_4 efficacy_age5_7 efficacy_age8_9 efficacy_ag
> e10_14 efficacy_age15 efficacy_age16_17 efficacy_age18_19 efficacy_age20_24 efficacy_age25_29
efficacy_age45_59 efficacy_age60_64 efficacy_age65_74 efficacy_age75_84 efficac
> y_age85_89 efficacy_age90over efficacy_male efficacy_ethnic_mixed efficacy_ethnic_asian
efficacy_ethnic_black efficacy_ethnic_other efficacy_country_europe efficacy_country_
> other efficacy_class1 efficacy_class2 efficacy_class3 efficacy_ses_students efficacy_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,318
-------------+----------------------------------   F(55, 1262)     =      8.50
       Model |  450.459097        55  8.19016541   Prob > F        =    0.0000
    Residual |  1216.01366     1,262  .963560745   R-squared       =    0.2703
-------------+----------------------------------   Adj R-squared   =    0.2385
       Total |  1666.47276     1,317  1.26535517   Root MSE        =    .98161

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           s_total_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
------------------------+---------------------------------------------------------------
                 age0_4 |  -.1507518   .0721006    -2.09   0.037                -.1312011
                 age5_7 |  -.0494091   .0530184    -0.93   0.352                -.0432623
                 age8_9 |  -.0936749   .0458806    -2.04   0.041                -.0820019
               age10_14 |  -.1315565   .0559558    -2.35   0.019                -.1173666
                  age15 |   .0450683   .0375319     1.20   0.230                 .0401669
               age16_17 |  -.0805256   .0422994    -1.90   0.057                -.0694146
               age18_19 |  -.1707236   .0508733    -3.36   0.001                -.1810628
               age20_24 |    .017773    .082296     0.22   0.829                 .0161781
               age25_29 |  -.1614326   .0902533    -1.79   0.074                -.1445907
               age45_59 |  -.0707293   .0648798    -1.09   0.276                -.0628518
               age60_64 |  -.0339892    .065455    -0.52   0.604                -.0301906
               age65_74 |  -.1215754   .0852631    -1.43   0.154                -.1070965
               age75_84 |   .0974487   .0736739     1.32   0.186                 .0852532
               age85_89 |   .0771987    .062462     1.24   0.217                 .0695495
              age90over |   .0787014   .0489425     1.61   0.108                 .0716896
                   male |  -.0557142   .0370487    -1.50   0.133                -.0493432
           ethnic_mixed |   .0965142   .0435639     2.22   0.027                 .0890814
           ethnic_asian |  -.1388371   .0735231    -1.89   0.059                -.1385493
           ethnic_black |    .085435   .0484807     1.76   0.078                 .0748617
           ethnic_other |  -.0717564   .0398645    -1.80   0.072                  -.06549
         country_europe |   .0528174   .0425794     1.24   0.215                 .0483019
          country_other |   .0159874   .1018955     0.16   0.875                 .0147354
                 class1 |  -.2741232   .1659678    -1.65   0.099                -.4831031
                 class2 |  -.0537348   .0697423    -0.77   0.441                 -.094096
                 class3 |  -.1747761   .1048788    -1.67   0.096                -.4549309
                  ses_8 |    .332793   .1210502     2.75   0.006                 .3136385
           ses_students |  -.1392658    .186212    -0.75   0.455                -.1326826
           efficacy_new |  -.0270125   .0294363    -0.92   0.359                -.0240137
        efficacy_age0_4 |   .0156267   .0720578     0.22   0.828                  .014542
        efficacy_age5_7 |  -.0101344   .0565718    -0.18   0.858                -.0092502
        efficacy_age8_9 |   .0125451   .0435667     0.29   0.773                 .0127464
      efficacy_age10_14 |   .0215644   .0541379     0.40   0.690                 .0219528
         efficacy_age15 |  -.0010858   .0404032    -0.03   0.979                -.0009071
      efficacy_age16_17 |   .0149249   .0482198     0.31   0.757                 .0127621
      efficacy_age18_19 |   .0044017   .0767161     0.06   0.954                 .0033025
      efficacy_age20_24 |   .0375965   .1027016     0.37   0.714                 .0284072
      efficacy_age25_29 |   .1469985   .0922777     1.59   0.111                  .120669
      efficacy_age45_59 |   .0820123   .0675755     1.21   0.225                 .0693708
      efficacy_age60_64 |   .0031308   .0679743     0.05   0.963                 .0027864
      efficacy_age65_74 |    .031356   .0905056     0.35   0.729                 .0274312
      efficacy_age75_84 |   .0804654   .0774737     1.04   0.299                 .0687433
      efficacy_age85_89 |    .022918   .0686392     0.33   0.739                 .0206903
     efficacy_age90over |   .0022214   .0529991     0.04   0.967                 .0020236
          efficacy_male |  -.0111968    .045122    -0.25   0.804                -.0083985
  efficacy_ethnic_mixed |    .041984     .04077     1.03   0.303                 .0414334
  efficacy_ethnic_asian |   .0051355   .0788598     0.07   0.948                 .0059707
  efficacy_ethnic_black |  -.0058146   .0473197    -0.12   0.902                -.0053353
  efficacy_ethnic_other |  -.0103314   .0460736    -0.22   0.823                -.0081369
efficacy_country_europe |  -.0032713   .0390718    -0.08   0.933                -.0034288
 efficacy_country_other |   -.014861    .116956    -0.13   0.899                -.0141448
        efficacy_class1 |  -.2366408   .1675905    -1.41   0.158                -.4617081
        efficacy_class2 |  -.0996069   .0715954    -1.39   0.164                 -.170352
        efficacy_class3 |  -.1649501   .1062686    -1.55   0.121                 -.447994
  efficacy_ses_students |  -.2195365   .1887268    -1.16   0.245                -.1669024
         efficacy_ses_8 |   -.159651   .1196422    -1.33   0.182                -.1879837
                  _cons |   .0050323   .0278954     0.18   0.857                        .
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. regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_a
> sian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
efficacy_new efficacy_age0_4 efficacy_age5_7 efficacy_age8_9 efficacy_age
> 10_14 efficacy_age15 efficacy_age16_17 efficacy_age18_19 efficacy_age20_24 efficacy_age25_29
efficacy_age45_59 efficacy_age60_64 efficacy_age65_74 efficacy_age75_84 efficacy
> _age85_89 efficacy_age90over efficacy_male efficacy_ethnic_mixed efficacy_ethnic_asian
efficacy_ethnic_black efficacy_ethnic_other efficacy_country_europe efficacy_country_o
> ther efficacy_class1 efficacy_class2 efficacy_class3 efficacy_ses_students efficacy_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,318
-------------+----------------------------------   F(55, 1262)     =      7.80
       Model |  404.621692        55  7.35675804   Prob > F        =    0.0000
    Residual |  1189.83099     1,262  .942813783   R-squared       =    0.2538
-------------+----------------------------------   Adj R-squared   =    0.2212
       Total |  1594.45269     1,317  1.21067023   Root MSE        =    .97099

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             s_high_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------------------+----------------------------------------------------------------
                  age0_4 |   -.122005   .0713202    -1.71   0.087                -.1085541
                  age5_7 |  -.0710407   .0524445    -1.35   0.176                -.0635922
                  age8_9 |   -.096602    .045384    -2.13   0.033                -.0864529
                age10_14 |  -.1121766   .0553502    -2.03   0.043                -.1023123
                   age15 |   .0568595   .0371257     1.53   0.126                 .0518076
                age16_17 |  -.0999125   .0418415    -2.39   0.017                -.0880501
                age18_19 |  -.1782157   .0503226    -3.54   0.000                -.1932301
                age20_24 |   .0083849   .0814052     0.10   0.918                  .007803
                age25_29 |  -.1882871   .0892764    -2.11   0.035                -.1724103
                age45_59 |  -.0532797   .0641775    -0.83   0.407                -.0484032
                age60_64 |  -.0346109   .0647465    -0.53   0.593                -.0314295
                age65_74 |  -.1201685   .0843401    -1.42   0.154                -.1082216
                age75_84 |   .0355736   .0728764     0.49   0.626                 .0318168
                age85_89 |   .0624239   .0617859     1.01   0.313                 .0574948
               age90over |   .0660769   .0484128     1.36   0.173                 .0615342
                    male |   -.055901   .0366477    -1.53   0.127                -.0506144
            ethnic_mixed |   .1477711   .0430923     3.43   0.001                 .1394371
            ethnic_asian |  -.0254812   .0727272    -0.35   0.726                -.0259963
            ethnic_black |   .1365951   .0479559     2.85   0.004                 .1223637
            ethnic_other |  -.0483634    .039433    -1.23   0.220                -.0451258
          country_europe |    .018765   .0421185     0.45   0.656                  .017544
           country_other |  -.0754667   .1007925    -0.75   0.454                -.0711101
                  class1 |  -.1751712   .1641713    -1.07   0.286                -.3156094
                  class2 |   -.024017   .0689874    -0.35   0.728                 -.042996
                  class3 |  -.1103928   .1037436    -1.06   0.287                -.2937632
                   ses_8 |     .36874   .1197399     3.08   0.002                 .3552783
            ses_students |  -.0245349   .1841964    -0.13   0.894                -.0238972
            efficacy_new |  -.0343068   .0291177    -1.18   0.239                -.0311793
         efficacy_age0_4 |   -.012239   .0712778    -0.17   0.864                -.0116438
         efficacy_age5_7 |  -.0219637   .0559594    -0.39   0.695                -.0204954
         efficacy_age8_9 |   .0020861   .0430951     0.05   0.961                 .0021669
       efficacy_age10_14 |  -.0009897   .0535519    -0.02   0.985                -.0010301
          efficacy_age15 |   .0063683   .0399658     0.16   0.873                 .0054387
       efficacy_age16_17 |  -.0210696   .0476979    -0.44   0.659                -.0184188
       efficacy_age18_19 |   .0046056   .0758857     0.06   0.952                 .0035327
       efficacy_age20_24 |  -.0064195     .10159    -0.06   0.950                -.0049588
       efficacy_age25_29 |   .0633144   .0912789     0.69   0.488                 .0531348
       efficacy_age45_59 |   .0272819    .066844     0.41   0.683                 .0235921
       efficacy_age60_64 |   .0066595   .0672385     0.10   0.921                 .0060593
       efficacy_age65_74 |    .005721   .0895259     0.06   0.949                 .0051167
       efficacy_age75_84 |   .0198508   .0766351     0.26   0.796                 .0173378
       efficacy_age85_89 |   .0191744   .0678962     0.28   0.778                 .0176972
      efficacy_age90over |  -.0038227   .0524254    -0.07   0.942                  -.00356
           efficacy_male |  -.0221781   .0446336    -0.50   0.619                -.0170069
   efficacy_ethnic_mixed |   .0416667   .0403287     1.03   0.302                 .0420386
   efficacy_ethnic_asian |  -.0194464   .0780062    -0.25   0.803                -.0231143
   efficacy_ethnic_black |  -.0117449   .0468075    -0.25   0.802                -.0110176
   efficacy_ethnic_other |  -.0341965   .0455749    -0.75   0.453                -.0275342
 efficacy_country_europe |  -.0078891   .0386489    -0.20   0.838                -.0084536
  efficacy_country_other |   .0483335     .11569     0.42   0.676                 .0470318
         efficacy_class1 |  -.2984542   .1657764    -1.80   0.072                -.5953178
         efficacy_class2 |   -.135371   .0708204    -1.91   0.056                -.2366882
         efficacy_class3 |  -.1975918   .1051183    -1.88   0.060                -.5486329
   efficacy_ses_students |  -.2997497    .186684    -1.61   0.109                -.2329743
          efficacy_ses_8 |  -.1921677   .1183472    -1.62   0.105                -.2313249
                   _cons |   .0108655   .0275934     0.39   0.694                        .
------------------------------------------------------------------------------------------

. regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic
> _asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
efficacy_new efficacy_age0_4 efficacy_age5_7 efficacy_age8_9 efficacy_a
> ge10_14 efficacy_age15 efficacy_age16_17 efficacy_age18_19 efficacy_age20_24 efficacy_age25_29
efficacy_age45_59 efficacy_age60_64 efficacy_age65_74 efficacy_age75_84 effica
> cy_age85_89 efficacy_age90over efficacy_male efficacy_ethnic_mixed efficacy_ethnic_asian
efficacy_ethnic_black efficacy_ethnic_other efficacy_country_europe efficacy_country
```

```
> _other efficacy_class1 efficacy_class2 efficacy_class3 efficacy_ses_students efficacy_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,293
-------------+----------------------------------   F(55, 1237)     =      7.60
       Model |  481.454624        55  8.75372043   Prob > F        =    0.0000
    Residual |  1424.26894     1,237  1.15138961   R-squared       =    0.2526
-------------+----------------------------------   Adj R-squared   =    0.2194
       Total |  1905.72357     1,292  1.47501824   Root MSE        =     1.073

------------------------------------------------------------------------------------------
          s_medium_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
------------------------+-----------------------------------------------------------------
                 age0_4 |   -.132319   .0798557    -1.66   0.098                -.1059354
                 age5_7 |  -.0715881   .0584355    -1.23   0.221                -.0579536
                 age8_9 |  -.1214628   .0505025    -2.41   0.016                -.0983749
               age10_14 |  -.0737464   .0620007    -1.19   0.234                 -.060783
                  age15 |   .0450203   .0414566     1.09   0.278                 .0371575
               age16_17 |  -.1089832   .0465443    -2.34   0.019                -.0871988
               age18_19 |  -.1773624   .0559975    -3.17   0.002                -.1757321
               age20_24 |   -.087053   .0905497    -0.96   0.337                -.0736734
               age25_29 |  -.1059331   .1005145    -1.05   0.292                -.0876307
               age45_59 |  -.1033183   .0715777    -1.44   0.149                -.0848217
               age60_64 |  -.0596063   .0724363    -0.82   0.411                -.0489821
               age65_74 |  -.0868431   .0940232    -0.92   0.356                -.0706192
               age75_84 |   .0505431   .0813789     0.62   0.535                 .0408313
               age85_89 |   .0691483   .0689997     1.00   0.316                 .0576132
              age90over |   .1439893   .0540104     2.67   0.008                 .1216086
                   male |    .002637   .0409097     0.06   0.949                  .002168
           ethnic_mixed |   .1024334    .048121     2.13   0.033                 .0876072
           ethnic_asian |  -.2043542   .0819713    -2.49   0.013                -.1903349
           ethnic_black |   .0273439   .0536465     0.51   0.610                 .0223046
           ethnic_other |  -.0447836   .0495034    -0.90   0.366                -.0355209
         country_europe |   .0232018   .0475741     0.49   0.626                 .0197062
          country_other |   .0066452   .1138447     0.06   0.953                 .0056932
                 class1 |  -.3437104   .1830154    -1.88   0.061                -.5615243
                 class2 |  -.0631813   .0768557    -0.82   0.411                -.1026042
                 class3 |  -.2064518   .1157577    -1.78   0.075                -.4961055
                  ses_8 |   .3434319   .1340811     2.56   0.011                 .2997904
           ses_students |  -.1151727   .2054644    -0.56   0.575                 -.102076
           efficacy_new |  -.0184529   .0326097    -0.57   0.572                -.0152109
        efficacy_age0_4 |  -.0447413   .0799876    -0.56   0.576                -.0385029
        efficacy_age5_7 |  -.0506995   .0623794    -0.81   0.417                -.0428739
        efficacy_age8_9 |   .0373985   .0481741     0.78   0.438                 .0351687
      efficacy_age10_14 |   .0531659   .0597362     0.89   0.374                 .0502816
         efficacy_age15 |  -.0433929   .0446079    -0.97   0.331                  -.03371
      efficacy_age16_17 |    .027945   .0531516     0.53   0.599                 .0221431
      efficacy_age18_19 |   .0255945   .0848728     0.30   0.763                 .0179257
      efficacy_age20_24 |   .0197742   .1129211     0.18   0.861                 .0138745
      efficacy_age25_29 |   .1659525   .1028658     1.61   0.107                 .1264521
      efficacy_age45_59 |   .0496107    .074886     0.66   0.508                 .0390165
      efficacy_age60_64 |  -.0614544   .0754833    -0.81   0.416                -.0506657
      efficacy_age65_74 |    .147704   .0998956     1.48   0.140                 .1186368
      efficacy_age75_84 |  -.0121446   .0863288    -0.14   0.888                -.0095412
      efficacy_age85_89 |   .0283093   .0754827     0.38   0.708                 .0237082
    efficacy_age90over |   .0043759   .0581625     0.08   0.940                 .0037129
          efficacy_male |  -.0287556   .0500765    -0.57   0.566                -.0199365
  efficacy_ethnic_mixed |   .0473335   .0448998     1.05   0.292                 .0434257
  efficacy_ethnic_asian |   .0321831   .0867836     0.37   0.711                 .0349621
  efficacy_ethnic_black |   .0107291   .0519545     0.21   0.836                 .0091781
  efficacy_ethnic_other |  -.0834769   .0593771    -1.41   0.160                -.0560524
efficacy_country_europe |  -.0026222   .0435609    -0.06   0.952                -.0025646
 efficacy_country_other |   .0181568   .1285583     0.14   0.888                  .016092
        efficacy_class1 |  -.3746792   .1847491    -2.03   0.043                -.6784047
        efficacy_class2 |   -.158325   .0787614    -2.01   0.045                 -.251627
        efficacy_class3 |  -.2458968   .1173608    -2.10   0.036                -.6162742
  efficacy_ses_students |  -.3940149   .2079149    -1.90   0.058                -.2780612
         efficacy_ses_8 |  -.2820326    .131641    -2.14   0.032                -.3100384
                  _cons |   .0218423   .0308533     0.71   0.479                        .
------------------------------------------------------------------------------------------

. regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_as
> ian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
efficacy_new efficacy_age0_4 efficacy_age5_7 efficacy_age8_9 efficacy_age1
> 0_14 efficacy_age15 efficacy_age16_17 efficacy_age18_19 efficacy_age20_24 efficacy_age25_29
efficacy_age45_59 efficacy_age60_64 efficacy_age65_74 efficacy_age75_84 efficacy_
> age85_89 efficacy_age90over efficacy_male efficacy_ethnic_mixed efficacy_ethnic_asian efficacy_ethnic_black
efficacy_ethnic_other efficacy_country_europe efficacy_country_ot
> her efficacy_class1 efficacy_class2 efficacy_class3 efficacy_ses_students efficacy_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,318
-------------+----------------------------------   F(55, 1262)     =      8.83
       Model |  401.668038        55  7.30305524   Prob > F        =    0.0000
    Residual |  1044.25524     1,262  .827460573   R-squared       =    0.2778
-------------+----------------------------------   Adj R-squared   =    0.2463
       Total |  1445.92328     1,317  1.09789163   Root MSE        =    .90965
```

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------------------------------------------------------------------------------------------
             s_low_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-----------------------+------------------------------------------------------------------
                 age0_4 |  -.1289879   .0668149    -1.93   0.054                -.1205177
                 age5_7 |  -.0183503   .0491315    -0.37   0.709                -.0172493
                 age8_9 |  -.0578026    .042517    -1.36   0.174                -.0543218
               age10_14 |  -.1647597   .0518537    -3.18   0.002                 -.157801
                  age15 |   .0323988   .0347805     0.93   0.352                 .0309993
               age16_17 |  -.0257271   .0391984    -0.66   0.512                -.0238086
               age18_19 |  -.1324498   .0471437    -2.81   0.005                -.1508042
               age20_24 |    .027752   .0762629     0.36   0.716                 .0271199
               age25_29 |  -.1353108   .0836368    -1.62   0.106                -.1301093
               age45_59 |  -.0885112   .0601234    -1.47   0.141                 -.084439
               age60_64 |  -.0446545   .0606564    -0.74   0.462                -.0425816
               age65_74 |  -.1195036   .0790124    -1.51   0.131                -.1130154
               age75_84 |   .1336841   .0682728     1.96   0.050                 .1255569
               age85_89 |   .1052046   .0578829     1.82   0.069                 .1017525
              age90over |   .0661359   .0453545     1.46   0.145                 .0646752
                   male |  -.0578906   .0343327    -1.69   0.092                -.0550422
           ethnic_mixed |   .0304765   .0403702     0.75   0.450                 .0301987
           ethnic_asian |  -.1217972    .068133    -1.79   0.074                -.1304856
           ethnic_black |   .0733829   .0449266     1.63   0.103                 .0690312
           ethnic_other |  -.0442319    .036942    -1.20   0.231                -.0433387
         country_europe |   .0617305   .0394578     1.56   0.118                 .0606057
          country_other |  -.0335913   .0944255    -0.36   0.722                 -.033238
                 class1 |  -.2793377   .1538006    -1.82   0.070                 -.528506
                 class2 |  -.0517137   .0646294    -0.80   0.424                -.0972182
                 class3 |  -.1695144   .0971901    -1.74   0.081                -.4736923
                  ses_8 |   .2477858   .1121759     2.21   0.027                 .2507021
           ses_students |   -.180717   .1725607    -1.05   0.295                -.1848396
           efficacy_new |  -.0034556   .0272783    -0.13   0.899                -.0032979
        efficacy_age0_4 |    .041794   .0667752     0.63   0.531                 .0417538
        efficacy_age5_7 |   .0184714   .0524245     0.35   0.725                 .0181002
        efficacy_age8_9 |   .0054114   .0403728     0.13   0.893                 .0059027
      efficacy_age10_14 |     .00139    .050169     0.03   0.978                 .0015191
         efficacy_age15 |   .0015893   .0374412     0.04   0.966                 .0014253
      efficacy_age16_17 |   .0258038   .0446848     0.58   0.564                 .0236876
      efficacy_age18_19 |  -.0452163    .071092    -0.64   0.525                  -.03642
      efficacy_age20_24 |   .0892906   .0951725     0.94   0.348                 .0724293
      efficacy_age25_29 |   .0927584   .0855128     1.08   0.278                 .0817453
      efficacy_age45_59 |   .0976533   .0626215     1.56   0.119                 .0886771
      efficacy_age60_64 |  -.0267736   .0629911    -0.43   0.671                -.0255812
      efficacy_age65_74 |   .0081359   .0838705     0.10   0.923                 .0076411
      efficacy_age75_84 |   .1050187    .071794     1.46   0.144                 .0963196
      efficacy_age85_89 |    .035805   .0636072     0.56   0.574                 .0347024
     efficacy_age90over |  -.0096845   .0491137    -0.20   0.844                -.0094708
          efficacy_male |  -.0212402   .0418141    -0.51   0.612                -.0171039
  efficacy_ethnic_mixed |   .0261069   .0377811     0.69   0.490                 .0276597
  efficacy_ethnic_asian |   .0482108   .0730785     0.66   0.510                 .0601753
  efficacy_ethnic_black |    -.007183   .0438507    -0.16   0.870                -.0070758
  efficacy_ethnic_other |  -.0131934   .0426959    -0.31   0.757                -.0111553
efficacy_country_europe |  -.0055604   .0362074    -0.15   0.878                -.0062568
 efficacy_country_other |   -.070391   .1083818    -0.65   0.516                -.0719273
        efficacy_class1 |  -.1005526   .1553043    -0.65   0.517                 -.210619
        efficacy_class2 |  -.0531584   .0663467    -0.80   0.423                -.0976014
        efficacy_class3 |   -.077987   .0984779    -0.79   0.429                -.2273883
  efficacy_ses_students |  -.0568326   .1748911    -0.32   0.745                -.0463852
         efficacy_ses_8 |  -.0883571   .1108712    -0.80   0.426                -.1116906
                  _cons |   .0124626   .0258503     0.48   0.630                        .
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. *Regressions with General health status

. regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_
> asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
general_health_status ghs_age0_4 ghs_age5_7 ghs_age8_9 ghs_age10_14 ghs_
> age15 ghs_age16_17 ghs_age18_19 ghs_age20_24 ghs_age25_29 ghs_age45_59 ghs_age60_64 ghs_age65_74
ghs_age75_84 ghs_age85_89 ghs_age90over ghs_male ghs_ethnic_mixed ghs_ethnic
> _asian ghs_ethnic_black ghs_ethnic_other ghs_country_europe ghs_country_other ghs_class1 ghs_class2
ghs_class3 ghs_ses_students ghs_ses_8, b

      Source |       SS           df       MS      Number of obs   =     3,610
-------------+----------------------------------   F(55, 3554)     =     27.97
       Model |  1349.47017        55  24.5358214   Prob > F        =    0.0000
    Residual |  3117.57665     3,554  .877202208   R-squared       =    0.3021
-------------+----------------------------------   Adj R-squared   =    0.2913
       Total |  4467.04682     3,609  1.23775196   Root MSE        =    .93659

------------------------------------------------------------------------------------------
         s_total_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
---------------------+------------------------------------------------------------------
               age0_4 |  -.0543993   .0423202    -1.29   0.199                -.0487122
               age5_7 |  -.0059888   .0306537    -0.20   0.845                -.0053797
               age8_9 |  -.0392931   .0260347    -1.51   0.131                -.0353186
             age10_14 |  -.0477341   .0323478    -1.48   0.140                -.0428854
```

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               age15 |  -.0037959   .0214021    -0.18   0.859                -.0034089
            age16_17 |  -.0220876   .0253404    -0.87   0.383                -.0198563
            age18_19 |  -.1946645   .0410394    -4.74   0.000                -.1750203
            age20_24 |   .0396038   .0560793     0.71   0.480                 .0356087
            age25_29 |  -.1033325   .0556922    -1.86   0.064                -.0927882
            age45_59 |  -.1040096   .0391613    -2.66   0.008                -.0933586
            age60_64 |  -.1027361   .0381759    -2.69   0.007                -.0922868
            age65_74 |  -.0827887   .0499865    -1.66   0.098                -.0744007
            age75_84 |   -.033003   .0455619    -0.72   0.469                -.0296605
            age85_89 |   .0887082   .0392947     2.26   0.024                 .0797383
           age90over |   .1045325   .0312713     3.34   0.001                 .0939906
                male |  -.0246634   .0212568    -1.16   0.246                -.0221508
        ethnic_mixed |    .051826   .0258127     2.01   0.045                 .0465581
        ethnic_asian |   -.099712   .0459406    -2.17   0.030                -.0896684
        ethnic_black |   .0906484   .0282074     3.21   0.001                 .0815127
        ethnic_other |  -.0659862   .0256259    -2.57   0.010                -.0592759
      country_europe |   .0766964   .0268708     2.85   0.004                 .0687975
       country_other |  -.0034821   .0629659    -0.06   0.956                -.0031312
              class1 |  -.0103833   .1001528    -0.10   0.917                -.0186457
              class2 |   .0583761   .0427438     1.37   0.172                 .1048772
              class3 |  -.0728154   .0609722    -1.19   0.232                -.1961952
               ses_8 |    .261324   .0729832     3.58   0.000                 .2343888
        ses_students |   .1041798   .1126614     0.92   0.355                  .093688
general_health_status |  -.4815451   .0583712    -8.25   0.000                -.4323913
           ghs_age0_4 |  -.0757607   .0377557    -2.01   0.045                -.0850561
           ghs_age5_7 |  -.0103608    .030182    -0.34   0.731                -.0117789
           ghs_age8_9 |  -.0159158   .0255224    -0.62   0.533                -.0176523
         ghs_age10_14 |  -.0730545   .0299608    -2.44   0.015                -.0849079
            ghs_age15 |  -.0065443   .0204995    -0.32   0.750                -.0071549
         ghs_age16_17 |   .0309578   .0212862     1.45   0.146                 .0361359
         ghs_age18_19 |   .0104288   .0300328     0.35   0.728                 .0164073
         ghs_age20_24 |  -.0617668   .0415067    -1.49   0.137                -.0922879
         ghs_age25_29 |  -.0811178   .0479159    -1.69   0.091                -.0845401
         ghs_age45_59 |  -.0642118   .0358304    -1.79   0.073                -.0715234
         ghs_age60_64 |   .0256876   .0370326     0.69   0.488                 .0271064
         ghs_age65_74 |  -.0867095    .043544    -1.99   0.047                -.1077349
         ghs_age75_84 |  -.0033182   .0405665    -0.08   0.935                -.0043435
         ghs_age85_89 |   .0652788   .0342141     1.91   0.056                 .0867328
        ghs_age90over |   .0051471   .0272971     0.19   0.850                 .0065078
             ghs_male |   .0264246   .0185872     1.42   0.155                 .0319693
     ghs_ethnic_mixed |   .0092544   .0269973     0.34   0.732                 .0083287
     ghs_ethnic_asian |  -.0091711    .041334    -0.22   0.824                -.0058231
     ghs_ethnic_black |  -.0117359    .025007    -0.47   0.639                -.0104264
     ghs_ethnic_other |  -.0107815   .0203673    -0.53   0.597                -.0121339
   ghs_country_europe |   .0195941   .0247202     0.79   0.428                 .0183887
    ghs_country_other |   .0043933   .0468863     0.09   0.925                   .00415
           ghs_class1 |  -.2769801    .091377    -3.03   0.002                -.5494318
           ghs_class2 |  -.1431125   .0378658    -3.78   0.000                -.3049989
           ghs_class3 |  -.1877432   .0574469    -3.27   0.001                -.5573246
     ghs_ses_students |  -.2861082   .1010683    -2.83   0.005                -.4588899
            ghs_ses_8 |  -.1043123   .0637665    -1.64   0.102                -.1012895
                _cons |   .0563241   .0201478     2.80   0.005                        .
--------------------------------------------------------------------------------------

. regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_a
> sian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
general_health_status ghs_age0_4 ghs_age5_7 ghs_age8_9 ghs_age10_14 ghs_a
> ge15 ghs_age16_17 ghs_age18_19 ghs_age20_24 ghs_age25_29 ghs_age45_59 ghs_age60_64 ghs_age65_74
ghs_age75_84 ghs_age85_89 ghs_age90over ghs_male ghs_ethnic_mixed ghs_ethnic_
> asian ghs_ethnic_black ghs_ethnic_other ghs_country_europe ghs_country_other ghs_class1 ghs_class2
ghs_class3 ghs_ses_students ghs_ses_8, b

      Source |       SS           df       MS      Number of obs   =     3,610
-------------+----------------------------------   F(55, 3554)     =     24.77
       Model |   1185.1772        55  21.5486764   Prob > F        =    0.0000
    Residual |  3091.76275     3,554  .869938872   R-squared       =    0.2771
-------------+----------------------------------   Adj R-squared   =    0.2659
       Total |  4276.93995     3,609  1.18507619   Root MSE        =    .93271

--------------------------------------------------------------------------------------
          s_high_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
----------------------+---------------------------------------------------------------
               age0_4 |   -.043666   .0421446    -1.04   0.300                -.0399605
               age5_7 |   -.006684   .0305265    -0.22   0.827                -.0061362
               age8_9 |  -.0311017   .0259267    -1.20   0.230                -.0285703
             age10_14 |  -.0455565   .0322136    -1.41   0.157                -.0418287
                age15 |   .0085731   .0213133     0.40   0.688                 .0078685
             age16_17 |  -.0364833   .0252353    -1.45   0.148                -.0335188
             age18_19 |  -.1914341   .0408692    -4.68   0.000                -.1758995
             age20_24 |   -.004435   .0558466    -0.08   0.937                -.0040752
             age25_29 |  -.0931662   .0554611    -1.68   0.093                -.0854984
             age45_59 |  -.0648899   .0389989    -1.66   0.096                -.0595253
             age60_64 |  -.1061502   .0380175    -2.79   0.005                -.0974497
             age65_74 |  -.0925954   .0497792    -1.86   0.063                  -.085043
             age75_84 |  -.0542531   .0453728    -1.20   0.232                -.0498303
             age85_89 |   .0420281   .0391317     1.07   0.283                 .0386088
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```
          age90over |   .0927404   .0311416     2.98   0.003                 .0852209
               male |  -.0192013   .0211686    -0.91   0.364                -.0176243
       ethnic_mixed |   .0936301   .0257056     3.64   0.000                  .085962
       ethnic_asian |   .0072429   .0457501     0.16   0.874                 .0066566
       ethnic_black |   .1424017   .0280903     5.07   0.000                 .1308651
       ethnic_other |  -.0428246   .0255196    -1.68   0.093                -.0393154
     country_europe |   .0477274   .0267594     1.78   0.075                 .0437532
      country_other |  -.0959871   .0627047    -1.53   0.126                -.0882101
             class1 |   .0572188   .0997373     0.57   0.566                 .1050094
             class2 |   .0844825   .0425665     1.98   0.047                  .155116
             class3 |  -.0240179   .0607192    -0.40   0.692                -.0661368
              ses_8 |   .2682185   .0726804     3.69   0.000                 .2458612
       ses_students |   .2304675    .112194     2.05   0.040                 .2118137
general_health_status |   -.486733    .058129    -8.37   0.000                -.4466574
         ghs_age0_4 |  -.0582407    .037599    -1.55   0.121                -.0668239
         ghs_age5_7 |  -.0092811   .0300568    -0.31   0.758                -.0107834
         ghs_age8_9 |  -.0325143   .0254165    -1.28   0.201                -.0368545
       ghs_age10_14 |  -.0603925   .0298365    -2.02   0.043                -.0717344
          ghs_age15 |  -.0096511   .0204145    -0.47   0.636                -.0107837
       ghs_age16_17 |   .0208237   .0211979     0.98   0.326                 .0248411
       ghs_age18_19 |   .0194413   .0299082     0.65   0.516                 .0312588
       ghs_age20_24 |  -.0277459   .0413345    -0.67   0.502                -.0423674
       ghs_age25_29 |  -.1077338   .0477171    -2.26   0.024                -.1147472
       ghs_age45_59 |  -.0573779   .0356818    -1.61   0.108                -.0653163
       ghs_age60_64 |   .0357895    .036879     0.97   0.332                 .0385964
       ghs_age65_74 |  -.1087655   .0433633    -2.51   0.012                -.1381099
       ghs_age75_84 |   .0103097   .0403982     0.26   0.799                  .013792
       ghs_age85_89 |   .0399059   .0340721     1.17   0.242                 .0541866
      ghs_age90over |   .0071068   .0271838     0.26   0.794                  .009183
           ghs_male |   .0234702   .0185101     1.27   0.205                 .0290192
   ghs_ethnic_mixed |   .0253872   .0268853     0.94   0.345                   .02335
   ghs_ethnic_asian |  -.0010961   .0411625    -0.03   0.979                -.0007113
   ghs_ethnic_black |  -.0217357   .0249032    -0.87   0.383                 -.019735
   ghs_ethnic_other |  -.0236538   .0202828    -1.17   0.244                -.0272062
 ghs_country_europe |   .0045092   .0246176     0.18   0.855                 .0043248
  ghs_country_other |    .023143   .0466918     0.50   0.620                  .022342
         ghs_class1 |  -.3027427   .0909979    -3.33   0.001                -.6137374
         ghs_class2 |  -.1582703   .0377087    -4.20   0.000                -.3447178
         ghs_class3 |  -.2080937   .0572086    -3.64   0.000                -.6313158
   ghs_ses_students |  -.3646428    .100649    -3.62   0.000                -.5977086
          ghs_ses_8 |  -.1361975    .063502    -2.14   0.032                  -.135158
              _cons |   .0447063   .0200642     2.23   0.026                        .
------------------------------------------------------------------------------------

. regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic
> _asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
general_health_status ghs_age0_4 ghs_age5_7 ghs_age8_9 ghs_age10_14 ghs
> _age15 ghs_age16_17 ghs_age18_19 ghs_age20_24 ghs_age25_29 ghs_age45_59 ghs_age60_64 ghs_age65_74
ghs_age75_84 ghs_age85_89 ghs_age90over ghs_male ghs_ethnic_mixed ghs_ethni
> c_asian ghs_ethnic_black ghs_ethnic_other ghs_country_europe ghs_country_other ghs_class1 ghs_class2
ghs_class3 ghs_ses_students ghs_ses_8, b

      Source |       SS           df       MS      Number of obs   =     3,540
-------------+----------------------------------   F(55, 3484)     =     24.83
       Model |  1337.87997        55  24.3250904   Prob > F        =    0.0000
    Residual |  3412.75609     3,484  .979551118   R-squared       =    0.2816
-------------+----------------------------------   Adj R-squared   =    0.2703
       Total |  4750.63607     3,539  1.34236679   Root MSE        =    .98972

------------------------------------------------------------------------------------
      s_medium_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
--------------------+---------------------------------------------------------------
             age0_4 |  -.0709327    .045347    -1.56   0.118                -.0604456
             age5_7 |  -.0227158   .0326233    -0.70   0.486                -.0195699
             age8_9 |  -.0335426   .0278547    -1.20   0.229                -.0289414
           age10_14 |  -.0438547   .0345019    -1.27   0.204                -.0377907
              age15 |  -.0045574   .0228977    -0.20   0.842                -.0039282
           age16_17 |  -.0349821   .0271102    -1.29   0.197                -.0302513
           age18_19 |  -.1273694   .0443433    -2.87   0.004                -.1102352
           age20_24 |    .007164   .0599905     0.12   0.905                 .0061881
           age25_29 |   -.044497   .0595539    -0.75   0.455                -.0380671
           age45_59 |   -.115091   .0417336    -2.76   0.006                -.0985823
           age60_64 |  -.1184929   .0406795    -2.91   0.004                -.1018143
           age65_74 |  -.0041159   .0533613    -0.08   0.939                 -.003537
           age75_84 |  -.0716893   .0485355    -1.48   0.140                -.0616991
           age85_89 |   .1068955   .0418872     2.55   0.011                 .0922035
          age90over |   .1442397   .0332447     4.34   0.000                 .1245242
               male |  -.0151092   .0226297    -0.67   0.504                -.0130219
       ethnic_mixed |   .0384174   .0274843     1.40   0.162                 .0331625
       ethnic_asian |  -.1118389   .0489384    -2.29   0.022                 -.097271
       ethnic_black |   .0639112   .0300445     2.13   0.033                 .0555497
       ethnic_other |  -.0543794   .0275777    -1.97   0.049                -.0457475
     country_europe |   .0548486   .0290099     1.89   0.059                 .0472675
      country_other |  -.0162489   .0670071    -0.24   0.808                -.0140366
             class1 |  -.0645248   .1073016    -0.60   0.548                -.1113289
             class2 |   .0284752   .0457853     0.62   0.534                 .0492016
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               class3 |  -.0928736   .0652806    -1.42   0.155                -.2401456
                ses_8 |   .2348126   .0781745     3.00   0.003                 .2026628
         ses_students |    .058783   .1206827     0.49   0.626                 .0508774
general_health_status |  -.4308497   .0623756    -6.91   0.000                -.3685243
           ghs_age0_4 |  -.0963305   .0408879    -2.36   0.019                -.1007468
           ghs_age5_7 |   .0046004   .0322563     0.14   0.887                 .0049831
           ghs_age8_9 |  -.0077605   .0277027    -0.28   0.779                -.0082147
         ghs_age10_14 |  -.0563521   .0323301    -1.74   0.081                -.0624064
            ghs_age15 |  -.0091731    .022088    -0.42   0.678                -.0095606
         ghs_age16_17 |   .0179928   .0229095     0.79   0.432                 .0201689
         ghs_age18_19 |  -.0620614   .0324489    -1.91   0.056                -.0945283
         ghs_age20_24 |  -.1199558   .0449847    -2.67   0.008                -.1721324
         ghs_age25_29 |  -.0601317    .053146    -1.13   0.258                -.0575663
         ghs_age45_59 |   -.081278   .0383199    -2.12   0.034                -.0845075
         ghs_age60_64 |  -.0368297   .0396545    -0.93   0.353                -.0366915
         ghs_age65_74 |  -.0465958   .0470951    -0.99   0.323                -.0551485
         ghs_age75_84 |  -.0022854   .0435867    -0.05   0.958                 -.002865
         ghs_age85_89 |   .0816143   .0365465     2.23   0.026                 .1038509
        ghs_age90over |  -.0045467   .0290513    -0.16   0.876                -.0055098
             ghs_male |   .0354651   .0200798     1.77   0.077                 .0408026
    ghs_ethnic_mixed |  -.0005029   .0289969    -0.02   0.986                -.0004308
     ghs_ethnic_asian |  -.0136328   .0448482    -0.30   0.761                -.0083248
     ghs_ethnic_black |  -.0335376    .026653    -1.26   0.208                -.0286859
     ghs_ethnic_other |  -.0190007    .022176    -0.86   0.392                -.0197687
   ghs_country_europe |   .0152067    .027083     0.56   0.575                 .0136468
    ghs_country_other |   .0272839   .0511624     0.53   0.594                 .0243536
           ghs_class1 |  -.1691233   .0986316    -1.71   0.086                 -.320778
           ghs_class2 |  -.0733126   .0407965    -1.80   0.072                -.1494068
           ghs_class3 |  -.1044195   .0618919    -1.69   0.092                -.2967984
     ghs_ses_students |  -.0696991   .1082634    -0.64   0.520                -.1081814
            ghs_ses_8 |  -.0470116   .0687917    -0.68   0.494                -.0434236
                _cons |   .0752528   .0214876     3.50   0.000                        .
-----------------------------------------------------------------------------------------

. regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_as
> ian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
general_health_status ghs_age0_4 ghs_age5_7 ghs_age8_9 ghs_age10_14 ghs_ag
> e15 ghs_age16_17 ghs_age18_19 ghs_age20_24 ghs_age25_29 ghs_age45_59 ghs_age60_64 ghs_age65_74 ghs_age75_84
ghs_age85_89 ghs_age90over ghs_male ghs_ethnic_mixed ghs_ethnic_a
> sian ghs_ethnic_black ghs_ethnic_other ghs_country_europe ghs_country_other ghs_class1 ghs_class2
ghs_class3 ghs_ses_students ghs_ses_8, b

      Source |       SS           df       MS      Number of obs   =     3,610
-------------+----------------------------------   F(55, 3554)     =     27.96
       Model |  1177.39289        55  21.4071434   Prob > F        =    0.0000
    Residual |   2720.7941     3,554  .765558272   R-squared       =    0.3020
-------------+----------------------------------   Adj R-squared   =    0.2912
       Total |  3898.18699     3,609   1.0801294   Root MSE        =    .87496

-----------------------------------------------------------------------------------------
           s_low_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
----------------------+------------------------------------------------------------------
               age0_4 |  -.0353796   .0395354    -0.89   0.371                -.0339138
               age5_7 |  -.0095866   .0286366    -0.33   0.738                -.0092185
               age8_9 |    -.02993   .0243216    -1.23   0.219                -.0287986
             age10_14 |   -.046115   .0302193    -1.53   0.127                -.0443508
                age15 |  -.0205124   .0199938    -1.03   0.305                -.0197199
             age16_17 |   .0121856    .023673     0.51   0.607                 .0117267
             age18_19 |  -.1552415    .038339    -4.05   0.000                 -.149413
             age20_24 |   .0858306   .0523892     1.64   0.101                 .0826115
             age25_29 |  -.1088535   .0520275    -2.09   0.036                 -.104635
             age45_59 |   -.130978   .0365845    -3.58   0.000                -.1258514
             age60_64 |  -.0986026   .0356639    -2.76   0.006                -.0948164
             age65_74 |  -.1125711   .0466974    -2.41   0.016                -.1082957
             age75_84 |   .0171345   .0425638     0.40   0.687                 .0164845
             age85_89 |   .1251449   .0367091     3.41   0.001                 .1204189
            age90over |    .084219   .0292136     2.88   0.004                 .0810629
                 male |   -.047196   .0198581    -2.38   0.018                -.0453755
         ethnic_mixed |   -.009399   .0241142    -0.39   0.697                -.0090387
         ethnic_asian |  -.0900712   .0429177    -2.10   0.036                -.0867075
         ethnic_black |   .0744152   .0263513     2.82   0.005                 .0716317
         ethnic_other |   -.052979   .0239397    -2.21   0.027                -.0509457
       country_europe |   .0751687   .0251027     2.99   0.003                 .0721795
        country_other |  -.0232598   .0588226    -0.40   0.693                -.0223896
               class1 |  -.0920322   .0935626    -0.98   0.325                 -.176915
               class2 |   .0303019   .0399312     0.76   0.448                 .0582766
               class3 |  -.1118869   .0569601    -1.96   0.050                -.3227181
                ses_8 |   .1677804   .0681808     2.46   0.014                 .1610933
         ses_students |  -.0601633   .1052482    -0.57   0.568                -.0579177
general_health_status |  -.4048121   .0545303    -7.42   0.000                  -.38911
           ghs_age0_4 |  -.0431036   .0352713    -1.22   0.222                 -.051803
           ghs_age5_7 |   -.006248    .028196    -0.22   0.825                -.0076038
           ghs_age8_9 |   .0149601    .023843     0.63   0.530                 .0177617
         ghs_age10_14 |  -.0718295   .0279893    -2.57   0.010                -.0893682
            ghs_age15 |  -.0077745   .0191506    -0.41   0.685                 -.009099
         ghs_age16_17 |   .0383726   .0198855     1.93   0.054                  .047948
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       ghs_age18_19 |   .0083568   .0280566     0.30   0.766                 .0140741
       ghs_age20_24 |  -.0539302   .0387755    -1.39   0.164                -.0862583
       ghs_age25_29 |  -.0528917    .044763    -1.18   0.237                -.0590083
       ghs_age45_59 |  -.0340513   .0334728    -1.02   0.309                -.0406019
       ghs_age60_64 |   .0333502   .0345958     0.96   0.335                 .0376726
       ghs_age65_74 |  -.0826965   .0406787    -2.03   0.042                -.1099906
       ghs_age75_84 |   .0182115   .0378971     0.48   0.631                  .025519
       ghs_age85_89 |   .0811385   .0319628     2.54   0.011                  .115403
      ghs_age90over |  -.0057968   .0255009    -0.23   0.820                -.0078458
           ghs_male |   .0274083   .0173641     1.58   0.115                 .0354965
   ghs_ethnic_mixed |  -.0151729   .0252208    -0.60   0.547                -.0146176
   ghs_ethnic_asian |  -.0369813   .0386141    -0.96   0.338                -.0251358
   ghs_ethnic_black |  -.0050369   .0233615    -0.22   0.829                -.0047903
   ghs_ethnic_other |   .0036413   .0190271     0.19   0.848                 .0043869
 ghs_country_europe |   .0328063   .0230936     1.42   0.156                 .0329582
  ghs_country_other |   .0339068   .0438012     0.77   0.439                 .0342866
         ghs_class1 |  -.2591098   .0853643    -3.04   0.002                -.5502093
         ghs_class2 |  -.1400074   .0353742    -3.96   0.000                -.3194115
         ghs_class3 |   -.170773   .0536668    -3.18   0.001                -.5426779
   ghs_ses_students |  -.2496163   .0944179    -2.64   0.008                -.4285783
          ghs_ses_8 |  -.1230808   .0595706    -2.07   0.039                -.1279375
              _cons |   .0576714   .0188221     3.06   0.002                        .
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. *Regressions with Access to services

. regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_
> asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
access_to_services ats_age0_4 ats_age5_7 ats_age8_9 ats_age10_14 ats_age
> 15 ats_age16_17 ats_age18_19 ats_age20_24 ats_age25_29 ats_age45_59 ats_age60_64 ats_age65_74 ats_age75_84
ats_age85_89 ats_age90over ats_male ats_ethnic_mixed ats_ethnic_as
> ian ats_ethnic_black ats_ethnic_other ats_country_europe ats_country_other ats_class1 ats_class2 ats_class3
ats_ses_students ats_ses_8, b

      Source |       SS           df       MS      Number of obs   =     3,610
-------------+----------------------------------   F(55, 3554)     =     23.66
       Model |  1197.17802        55  21.7668732   Prob > F        =    0.0000
    Residual |   3269.8688     3,554  .920053123   R-squared       =    0.2680
-------------+----------------------------------   Adj R-squared   =    0.2567
       Total |  4467.04682     3,609  1.23775196   Root MSE        =    .95919

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      s_total_jnsn |      Coef.   Std. Err.      t    P>|t|                  Beta
-------------------+--------------------------------------------------------------
            age0_4 |  -.0987629   .0422596    -2.34   0.019                -.0884378
            age5_7 |  -.0205888   .0307417    -0.67   0.503                -.0184948
            age8_9 |  -.0516987     .02625    -1.97   0.049                -.0464693
          age10_14 |  -.0793838   .0318932    -2.49   0.013                -.0713202
             age15 |    .002796   .0217966     0.13   0.898                  .002511
          age16_17 |  -.0342889   .0248618    -1.38   0.168                 -.030825
          age18_19 |  -.1391765   .0396105    -3.51   0.000                -.1251317
          age20_24 |   -.051385   .0513627    -1.00   0.317                -.0462015
          age25_29 |  -.1089698   .0541512    -2.01   0.044                -.0978503
          age45_59 |  -.0655808   .0381912    -1.72   0.086                -.0588651
          age60_64 |  -.0483096   .0387163    -1.25   0.212                 -.043396
          age65_74 |   -.012347   .0498337    -0.25   0.804                 -.011096
          age75_84 |    .038604   .0433911     0.89   0.374                 .0346943
          age85_89 |   .0908474   .0370407     2.45   0.014                 .0816611
         age90over |   .1382489   .0288314     4.80   0.000                 .1243068
              male |  -.0300924    .022035    -1.37   0.172                -.0270267
      ethnic_mixed |   .0915153   .0294147     3.11   0.002                 .0822131
      ethnic_asian |  -.0637593   .0557051    -1.14   0.252                -.0573371
      ethnic_black |   .0375476    .039585     0.95   0.343                 .0337635
      ethnic_other |   -.082147   .0297137    -2.76   0.006                -.0737933
    country_europe |   .0460054   .0261735     1.76   0.079                 .0412673
     country_other |   5.22e-06   .0576812     0.00   1.000                 4.69e-06
            class1 |  -.1869363    .094871    -1.97   0.049                 -.335691
            class2 |   .0096228    .040397     0.24   0.812                 .0172881
            class3 |  -.0876296   .0598202    -1.46   0.143                -.2361108
             ses_8 |    .348069   .0701866     4.96   0.000                 .3121928
      ses_students |   .0227839   .1102893     0.21   0.836                 .0204894
access_to_services |  -.0994057     .02492    -3.99   0.000                 -.089384
        ats_age0_4 |   .0780204   .0467026     1.67   0.095                 .0651602
        ats_age5_7 |   .0314639   .0312313     1.01   0.314                 .0267961
        ats_age8_9 |   .0053894   .0264111     0.20   0.838                 .0045495
      ats_age10_14 |   .0071569   .0340325     0.21   0.833                 .0060314
         ats_age15 |   .0268071   .0225063     1.19   0.234                 .0233727
      ats_age16_17 |  -.0014253   .0267975    -0.05   0.958                -.0012009
      ats_age18_19 |   .0667507   .0418434     1.60   0.111                 .0540145
      ats_age20_24 |   .0338199   .0507278     0.67   0.505                 .0264462
      ats_age25_29 |  -.0827291    .060705    -1.36   0.173                -.0700657
      ats_age45_59 |   .0616512   .0421861     1.46   0.144                 .0584264
      ats_age60_64 |   .0337581   .0383945     0.88   0.379                 .0331478
      ats_age65_74 |   .1192689   .0513323     2.32   0.020                 .1079844
      ats_age75_84 |  -.0296154   .0471049    -0.63   0.530                -.0243454
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      ats_age85_89 |  -.0400019   .0386275    -1.04   0.300                -.0334893
      ats_age90over |   .0713655   .0301494     2.37   0.018                 .0601107
          ats_male |  -.0150599   .0204022    -0.74   0.460                -.0158874
  ats_ethnic_mixed |   .0268719   .0359655     0.75   0.455                 .0231968
  ats_ethnic_asian |   .0476701   .0536853     0.89   0.375                 .0432529
  ats_ethnic_black |  -.0396038   .0458408    -0.86   0.388                -.0313384
  ats_ethnic_other |  -.0099295   .0399692    -0.25   0.804                -.0070462
ats_country_europe |   .0258647   .0286205     0.90   0.366                 .0218845
 ats_country_other |   .0042007    .040708     0.10   0.918                 .0040227
        ats_class1 |   .1590185    .098011     1.62   0.105                 .2470636
        ats_class2 |   .0661424   .0427488     1.55   0.122                 .1158346
        ats_class3 |   .1051711   .0617191     1.70   0.088                 .2497635
  ats_ses_students |   .1195538   .1168592     1.02   0.306                 .0854843
         ats_ses_8 |   .1658587   .0720901     2.30   0.021                 .1440865
             _cons |  -.0595122   .0206178    -2.89   0.004                        .
------------------------------------------------------------------------------------

. regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_a
> sian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
access_to_services ats_age0_4 ats_age5_7 ats_age8_9 ats_age10_14 ats_age1
> 5 ats_age16_17 ats_age18_19 ats_age20_24 ats_age25_29 ats_age45_59 ats_age60_64 ats_age65_74 ats_age75_84
ats_age85_89 ats_age90over ats_male ats_ethnic_mixed ats_ethnic_asi
> an ats_ethnic_black ats_ethnic_other ats_country_europe ats_country_other ats_class1 ats_class2 ats_class3
ats_ses_students ats_ses_8, b

      Source |       SS           df       MS      Number of obs   =     3,610
-------------+----------------------------------   F(55, 3554)     =     21.58
       Model |  1070.70134        55  19.4672971   Prob > F        =    0.0000
    Residual |  3206.23861     3,554  .902149301   R-squared       =    0.2503
-------------+----------------------------------   Adj R-squared   =    0.2387
       Total |  4276.93995     3,609  1.18507619   Root MSE        =    .94982

------------------------------------------------------------------------------------
       s_high_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------------+----------------------------------------------------------------
            age0_4 |  -.0836968   .0418464    -2.00   0.046                -.0765943
            age5_7 |  -.0219547   .0304411    -0.72   0.471                -.0201553
            age8_9 |  -.0436608   .0259933    -1.68   0.093                -.0401072
          age10_14 |  -.0766506   .0315813    -2.43   0.015                -.0703785
             age15 |   .0156077   .0215835     0.72   0.470                 .0143249
          age16_17 |  -.0535169   .0246187    -2.17   0.030                -.0491683
          age18_19 |  -.1387986   .0392232    -3.54   0.000                -.1275353
          age20_24 |  -.0742772   .0508605    -1.46   0.144                -.0682525
          age25_29 |  -.1219228   .0536217    -2.27   0.023                -.1118882
          age45_59 |  -.0318967   .0378178    -0.84   0.399                -.0292598
          age60_64 |  -.0547624   .0383378    -1.43   0.153                -.0502739
          age65_74 |  -.0185265   .0493464    -0.38   0.707                -.0170154
          age75_84 |   .0128794   .0429668     0.30   0.764                 .0118294
          age85_89 |   .0576721   .0366786     1.57   0.116                   .05298
         age90over |   .1245226   .0285495     4.36   0.000                  .114426
              male |   -.025112   .0218195    -1.15   0.250                -.0230496
      ethnic_mixed |   .1425347   .0291271     4.89   0.000                 .1308614
      ethnic_asian |   .0348692   .0551604     0.63   0.527                 .0320463
      ethnic_black |   .0841849   .0391979     2.15   0.032                 .0773647
      ethnic_other |  -.0518969   .0294232    -1.76   0.078                -.0476442
    country_europe |   .0239937   .0259176     0.93   0.355                 .0219958
     country_other |  -.1077254   .0571172    -1.89   0.059                -.0989973
            class1 |  -.1130599   .0939434    -1.20   0.229                -.2074906
            class2 |   .0338443   .0400021     0.85   0.398                 .0621405
            class3 |  -.0369472   .0592353    -0.62   0.533                -.1017398
             ses_8 |   .3645917   .0695003     5.25   0.000                 .3342012
      ses_students |    .109889   .1092109     1.01   0.314                 .1009946
access_to_services |  -.1126511   .0246764    -4.57   0.000                -.1035208
        ats_age0_4 |     .06992    .046246     1.51   0.131                 .0596788
        ats_age5_7 |   .0357973    .030926     1.16   0.247                 .0311568
        ats_age8_9 |  -.0002987   .0261528    -0.01   0.991                -.0002577
      ats_age10_14 |   .0156482   .0336998     0.46   0.642                 .0134772
         ats_age15 |   .0261482   .0222863     1.17   0.241                 .0232994
      ats_age16_17 |  -.0147561   .0265355    -0.56   0.578                -.0127066
      ats_age18_19 |   .0682107   .0414343     1.65   0.100                 .0564093
      ats_age20_24 |   .0746821   .0502318     1.49   0.137                 .0596831
      ats_age25_29 |  -.0839754   .0601115    -1.40   0.163                -.0726847
      ats_age45_59 |   .0596665   .0417736     1.43   0.153                 .0577885
      ats_age60_64 |   .0337104   .0380191     0.89   0.375                 .0338286
      ats_age65_74 |   .1304814   .0508304     2.57   0.010                  .120733
      ats_age75_84 |  -.0399356   .0466443    -0.86   0.392                -.0335508
      ats_age85_89 |  -.0512892   .0382498    -1.34   0.180                -.0438829
     ats_age90over |   .0689912   .0298546     2.31   0.021                 .0593882
          ats_male |  -.0289905   .0202028    -1.43   0.151                -.0312557
  ats_ethnic_mixed |   .0502422   .0356138     1.41   0.158                 .0443242
  ats_ethnic_asian |   .0304684   .0531603     0.57   0.567                 .0282528
  ats_ethnic_black |   -.060762   .0453926    -1.34   0.181                -.0491378
  ats_ethnic_other |   .0202965   .0395784     0.51   0.608                 .0147196
ats_country_europe |   .0208885   .0283406     0.74   0.461                 .0180626
 ats_country_other |   .0003421   .0403099     0.01   0.993                 .0003348
        ats_class1 |   .0741936   .0970527     0.76   0.445                 .1178071
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       ats_class2 |   .0412214   .0423308     0.97   0.330                .0737777
       ats_class3 |   .0549219   .0611156     0.90   0.369                .1332975
 ats_ses_students |  -.0046271   .1157166    -0.04   0.968               -.0033812
        ats_ses_8 |   .1228826   .0713852     1.72   0.085                .1090985
            _cons |  -.0531536   .0204162    -2.60   0.009                       .
------------------------------------------------------------------------------------

. regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic
> _asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
access_to_services ats_age0_4 ats_age5_7 ats_age8_9 ats_age10_14 ats_ag
> e15 ats_age16_17 ats_age18_19 ats_age20_24 ats_age25_29 ats_age45_59 ats_age60_64 ats_age65_74 ats_age75_84
ats_age85_89 ats_age90over ats_male ats_ethnic_mixed ats_ethnic_a
> sian ats_ethnic_black ats_ethnic_other ats_country_europe ats_country_other ats_class1 ats_class2
ats_class3 ats_ses_students ats_ses_8, b

      Source |       SS           df       MS      Number of obs   =     3,540
-------------+----------------------------------   F(55, 3484)     =     21.77
       Model |  1214.94573        55  22.0899224   Prob > F        =    0.0000
    Residual |  3535.69034     3,484  1.01483649   R-squared       =    0.2557
-------------+----------------------------------   Adj R-squared   =    0.2440
       Total |  4750.63607     3,539  1.34236679   Root MSE        =    1.0074

------------------------------------------------------------------------------------
     s_medium_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------------+----------------------------------------------------------------
            age0_4 |  -.0935956   .0451092    -2.07   0.038               -.0797578
            age5_7 |  -.0326625   .0325557    -1.00   0.316               -.0281391
            age8_9 |  -.0374504   .0279449    -1.34   0.180               -.0323132
          age10_14 |  -.0608494   .0339161    -1.79   0.073               -.0524354
             age15 |   .0050006   .0231614     0.22   0.829                .0043102
          age16_17 |  -.0377156   .0262992    -1.43   0.152               -.0326151
          age18_19 |  -.1375889    .042001    -3.28   0.001               -.1190799
          age20_24 |  -.0640129   .0547312    -1.17   0.242               -.0552929
          age25_29 |  -.0598016   .0583168    -1.03   0.305               -.0511601
          age45_59 |  -.0693768   .0405376    -1.71   0.087               -.0594254
          age60_64 |  -.0651048   .0410718    -1.59   0.113               -.0559409
          age65_74 |   .0510544   .0530619     0.96   0.336                .0438728
          age75_84 |  -.0122627   .0461184    -0.27   0.790               -.0105539
          age85_89 |   .0967112   .0392028     2.47   0.014                 .083419
         age90over |   .1761893   .0305258     5.77   0.000                .1521068
              male |  -.0055116   .0233244    -0.24   0.813               -.0047502
      ethnic_mixed |   .0566603   .0312221     1.81   0.070                  .04891
      ethnic_asian |  -.1199126    .059619    -2.01   0.044                -.104293
      ethnic_black |   .0025076   .0419813     0.06   0.952                .0021795
      ethnic_other |  -.0686419   .0322815    -2.13   0.034               -.0577461
    country_europe |   .0319974    .028167     1.14   0.256                .0275748
     country_other |   .0568152   .0622545     0.91   0.362                .0490798
            class1 |  -.2367067   .1009895    -2.34   0.019               -.4084059
            class2 |  -.0111112   .0430392    -0.26   0.796               -.0191988
            class3 |  -.1094961   .0636359    -1.72   0.085                -.283127
             ses_8 |   .3337245   .0746313     4.47   0.000                 .288032
      ses_students |  -.0397915   .1170341    -0.34   0.734                 -.03444
access_to_services |   -.107523   .0264565    -4.06   0.000               -.0930926
        ats_age0_4 |   .0869916   .0499246     1.74   0.082                .0692144
        ats_age5_7 |   .0282344   .0329815     0.86   0.392                .0230983
        ats_age8_9 |  -.0120244   .0279753    -0.43   0.667               -.0097866
      ats_age10_14 |   .0296386   .0360581     0.82   0.411                 .024003
         ats_age15 |   .0220207    .023831     0.92   0.356                 .018447
      ats_age16_17 |  -.0116671   .0283843    -0.41   0.681               -.0094694
      ats_age18_19 |   .0381743   .0443662     0.86   0.390                 .029635
      ats_age20_24 |   -.013036   .0540108    -0.24   0.809               -.0097309
      ats_age25_29 |  -.0908527    .064842    -1.40   0.161               -.0732913
      ats_age45_59 |   .0697963   .0447385     1.56   0.119                .0632834
      ats_age60_64 |   .0085722   .0406634     0.21   0.833                .0080732
      ats_age65_74 |   .0762466   .0545554     1.40   0.162                .0662128
      ats_age75_84 |  -.0362533   .0499248    -0.73   0.468               -.0285846
      ats_age85_89 |  -.0148131   .0408476    -0.36   0.717               -.0118965
     ats_age90over |   .0392318   .0318744     1.23   0.218                .0317345
          ats_male |  -.0243062   .0215529    -1.13   0.260               -.0245821
  ats_ethnic_mixed |  -.0328538   .0380942    -0.86   0.389                -.027374
  ats_ethnic_asian |   .0808413   .0568757     1.42   0.155                .0710117
  ats_ethnic_black |  -.0086533   .0485881    -0.18   0.859               -.0066214
  ats_ethnic_other |  -.0208609   .0424104    -0.49   0.623                -.014141
ats_country_europe |    .059175   .0306922     1.93   0.054                  .04805
 ats_country_other |   .0073404   .0432434     0.17   0.865                .0067924
        ats_class1 |   .0670363   .1041131     0.64   0.520                .1001959
        ats_class2 |   .0435557   .0454068     0.96   0.338                .0733785
        ats_class3 |   .0564036   .0654823     0.86   0.389                .1284829
  ats_ses_students |   .0547469   .1237833     0.44   0.658                 .037553
         ats_ses_8 |   .0773244   .0765503     1.01   0.313                .0646294
             _cons |  -.0411208   .0218733    -1.88   0.060                       .
------------------------------------------------------------------------------------

. regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_as
> ian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
```

```
access_to_services ats_age0_4 ats_age5_7 ats_age8_9 ats_age10_14 ats_age15
>  ats_age16_17 ats_age18_19 ats_age20_24 ats_age25_29 ats_age45_59 ats_age60_64 ats_age65_74 ats_age75_84
ats_age85_89 ats_age90over ats_male ats_ethnic_mixed ats_ethnic_asia
> n ats_ethnic_black ats_ethnic_other ats_country_europe ats_country_other ats_class1 ats_class2 ats_class3
ats_ses_students ats_ses_8, b

      Source |       SS           df       MS      Number of obs   =     3,610
-------------+----------------------------------   F(55, 3554)     =     24.01
       Model |  1055.90135        55  19.1982064   Prob > F        =    0.0000
    Residual |  2842.28564     3,554  .799742723   R-squared       =    0.2709
-------------+----------------------------------   Adj R-squared   =    0.2596
       Total |  3898.18699     3,609   1.0801294   Root MSE        =    .89428

------------------------------------------------------------------------------------
        s_low_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------------+----------------------------------------------------------------
            age0_4 |  -.0762072   .0393998    -1.93   0.053                -.0730498
            age5_7 |  -.0272263   .0286614    -0.95   0.342                -.0261809
            age8_9 |  -.0400097   .0244736    -1.63   0.102                -.0384973
          age10_14 |  -.0783808   .0297349    -2.64   0.008                -.0753823
             age15 |  -.0165203   .0203216    -0.81   0.416                 -.015882
          age16_17 |  -.0048854   .0231794    -0.21   0.833                -.0047015
          age18_19 |  -.1206272     .03693    -3.27   0.001                -.1160983
          age20_24 |  -.0143427   .0478869    -0.30   0.765                -.0138047
          age25_29 |  -.1105053   .0504866    -2.19   0.029                -.1062229
          age45_59 |  -.1034096   .0356067    -2.90   0.004                -.0993621
          age60_64 |  -.0481066   .0360963    -1.33   0.183                -.0462593
          age65_74 |  -.0339051   .0464613    -0.73   0.466                -.0326174
          age75_84 |    .061913   .0404547     1.53   0.126                 .0595643
          age85_89 |   .1097531   .0345341     3.18   0.001                 .1056084
        age90over |   .1190758   .0268803     4.43   0.000                 .1146135
              male |  -.0526243   .0205438    -2.56   0.010                -.0505944
      ethnic_mixed |   .0146185   .0274241     0.53   0.594                 .0140582
      ethnic_asian |  -.0883429   .0519354    -1.70   0.089                -.0850438
      ethnic_black |   .0267786   .0369062     0.73   0.468                  .025777
      ethnic_other |  -.0674076   .0277029    -2.43   0.015                -.0648206
    country_europe |   .0363508   .0244023     1.49   0.136                 .0349053
     country_other |   .0206065   .0537778     0.38   0.702                 .0198356
            class1 |  -.2367993   .0884509    -2.68   0.007                -.4552033
            class2 |   -.010101   .0376633    -0.27   0.789                -.0194262
            class3 |  -.1239225    .055772    -2.22   0.026                -.3574327
             ses_8 |     .26174   .0654369     4.00   0.000                 .2513081
      ses_students |  -.0770259   .1028258    -0.75   0.454                -.0741509
access_to_services |  -.0837379   .0232336    -3.60   0.000                -.0806026
        ats_age0_4 |   .0302154   .0435421     0.69   0.488                 .0270136
        ats_age5_7 |   .0295365   .0291178     1.01   0.310                 .0269276
        ats_age8_9 |  -.0076444   .0246238    -0.31   0.756                -.0069078
      ats_age10_14 |  -.0134657   .0317295    -0.42   0.671                -.0121479
         ats_age15 |   .0180975   .0209833     0.86   0.388                 .0168911
      ats_age16_17 |   .0085709    .024984     0.34   0.732                 .0077307
      ats_age18_19 |   .0439088   .0390118     1.13   0.260                 .0380352
      ats_age20_24 |    .027923    .047295     0.59   0.555                 .0233739
      ats_age25_29 |  -.0874187    .056597    -1.54   0.123                -.0792557
      ats_age45_59 |   .0114566   .0393312     0.29   0.771                 .0116226
      ats_age60_64 |   .0250779   .0357963     0.70   0.484                 .0263601
      ats_age65_74 |   .0770434   .0478585     1.61   0.108                 .0746704
      ats_age75_84 |  -.0473869   .0439172    -1.08   0.281                   -.0417
      ats_age85_89 |  -.0575834   .0360135    -1.60   0.110                -.0516062
     ats_age90over |   .0641629   .0281091     2.28   0.023                  .057853
          ats_male |  -.0211326   .0190216    -1.11   0.267                -.0238649
  ats_ethnic_mixed |   .0247174   .0335316     0.74   0.461                 .0228408
  ats_ethnic_asian |   .0502028   .0500523     1.00   0.316                 .0487613
  ats_ethnic_black |  -.0255744   .0427387    -0.60   0.550                -.0216633
  ats_ethnic_other |  -.0146381   .0372644    -0.39   0.694                -.0111197
ats_country_europe |   .0033771   .0266837     0.13   0.899                 .0030588
 ats_country_other |  -.0001288   .0379532    -0.00   0.997                 -.000132
        ats_class1 |   .1613488   .0913784     1.77   0.078                 .2683527
        ats_class2 |   .0559573   .0398559     1.40   0.160                 .1049044
        ats_class3 |   .1024074   .0575424     1.78   0.075                 .2603413
  ats_ses_students |   .1169966   .1089511     1.07   0.283                  .089552
         ats_ses_8 |   .1619836   .0672116     2.41   0.016                 .1506381
             _cons |  -.0200917   .0192226    -1.05   0.296                        .
------------------------------------------------------------------------------------

.
. *Regressions with social measures: Separately

. *social_close_knit social_help social_friends same_area_friends

. regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_
> asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_close_knit sck_age0_4 sck_age5_7 sck_age8_9 sck_age10_14 sck_age1
> 5 sck_age16_17 sck_age18_19 sck_age20_24 sck_age25_29 sck_age45_59 sck_age60_64 sck_age65_74 sck_age75_84
sck_age85_89 sck_age90over sck_male sck_ethnic_mixed sck_ethnic_asi
> an sck_ethnic_black sck_ethnic_other sck_country_europe sck_country_other sck_class1 sck_class2 sck_class3
sck_ses_students sck_ses_8, b
```

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      Source |       SS           df       MS      Number of obs   =     1,416
-------------+----------------------------------   F(55, 1360)     =      9.67
       Model |  504.515593        55  9.17301077   Prob > F        =    0.0000
    Residual |  1289.81879     1,360  .948396169   R-squared       =    0.2812
-------------+----------------------------------   Adj R-squared   =    0.2521
       Total |  1794.33438     1,415  1.26808084   Root MSE        =    .97386

------------------------------------------------------------------------------------
      s_total_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------------+----------------------------------------------------------------
            age0_4 |  -.0569263    .069508    -0.82   0.413                -.0502298
            age5_7 |  -.0432663     .05042    -0.86   0.391                -.0382954
            age8_9 |  -.0650855   .0443775    -1.47   0.143                -.0575098
          age10_14 |  -.1219893   .0546409    -2.23   0.026                 -.108866
             age15 |   .0578797   .0355173     1.63   0.103                   .05129
          age16_17 |  -.0592102   .0414025    -1.43   0.153                -.0508609
          age18_19 |  -.1292297   .0469623    -2.75   0.006                -.1125229
          age20_24 |   .0381141   .0788371     0.48   0.629                 .0349546
          age25_29 |  -.0938329   .0835745    -1.12   0.262                -.0865436
          age45_59 |  -.0227049   .0615487    -0.37   0.712                -.0202378
          age60_64 |   .0247872   .0627395     0.40   0.693                  .022006
          age65_74 |  -.0807952   .0825113    -0.98   0.328                -.0704406
          age75_84 |   .0773847   .0705751     1.10   0.273                 .0667014
          age85_89 |    .104776   .0608495     1.72   0.085                 .0926998
         age90over |   .1292627    .047756     2.71   0.007                 .1136816
              male |  -.0609408   .0329399    -1.85   0.065                -.0576266
      ethnic_mixed |   .0386148   .0410851     0.94   0.347                 .0365155
      ethnic_asian |  -.1855228   .0710756    -2.61   0.009                -.1964343
      ethnic_black |   .0781039   .0470289     1.66   0.097                 .0733487
      ethnic_other |  -.0504478   .0407964    -1.24   0.216                -.0468203
    country_europe |   .0588414   .0413376     1.42   0.155                 .0552374
     country_other |   .1161093   .0974517     1.19   0.234                 .1114676
            class1 |  -.2624135   .1561829    -1.68   0.093                 -.456505
            class2 |  -.0513892   .0666556    -0.77   0.441                  -.08884
            class3 |  -.1594715   .0987414    -1.62   0.107                -.4057865
             ses_8 |   .2793504    .114644     2.44   0.015                 .2772624
      ses_students |  -.1408562   .1758759    -0.80   0.423                -.1273179
 social_close_knit |   .0143465   .0278407     0.52   0.606                 .0127455
        sck_age0_4 |   .0146542   .0711085     0.21   0.837                 .0133833
        sck_age5_7 |  -.0467353   .0517322    -0.90   0.366                -.0419488
        sck_age8_9 |   .0722225   .0427176     1.69   0.091                 .0653811
      sck_age10_14 |   .0536894   .0541954     0.99   0.322                 .0498529
         sck_age15 |  -.0079344   .0361011    -0.22   0.826                -.0074163
      sck_age16_17 |  -.0190412   .0391301    -0.49   0.627                -.0179332
      sck_age18_19 |  -.1101199   .0686236    -1.60   0.109                -.0652556
      sck_age20_24 |   .0031634    .078551     0.04   0.968                  .002719
      sck_age25_29 |   .0170549   .0863575     0.20   0.843                 .0162517
      sck_age45_59 |   .0248615    .062683     0.40   0.692                 .0224416
      sck_age60_64 |  -.0239875   .0612602    -0.39   0.695                -.0218788
      sck_age65_74 |   .0566203   .0851586     0.66   0.506                 .0472442
      sck_age75_84 |  -.0022723     .07206    -0.03   0.975                -.0018193
      sck_age85_89 |  -.0800307   .0580242    -1.38   0.168                -.0681748
     sck_age90over |     .06076    .045941     1.32   0.186                 .0536665
          sck_male |  -.0620051    .032511    -1.91   0.057                -.0615817
  sck_ethnic_mixed |  -.0452591   .0398806    -1.13   0.257                -.0440677
  sck_ethnic_asian |  -.0364788   .0734511    -0.50   0.620                 -.039501
  sck_ethnic_black |   .0055753   .0446977     0.12   0.901                 .0058325
  sck_ethnic_other |   .0460795   .0396608     1.16   0.246                 .0468418
sck_country_europe |  -.0515404   .0421481    -1.22   0.222                -.0497587
 sck_country_other |   .0450842   .1043537     0.43   0.666                 .0450894
        sck_class1 |   .1580852   .1635648     0.97   0.334                 .2815575
        sck_class2 |   .0502054   .0702668     0.71   0.475                 .0882504
        sck_class3 |   .1010403   .1035957     0.98   0.330                  .258672
  sck_ses_students |   .2436874   .1787789     1.36   0.173                 .1953284
         sck_ses_8 |    .066498   .1216236     0.55   0.585                 .0692037
             _cons |   -.005004   .0272987    -0.18   0.855                        .
------------------------------------------------------------------------------------

. regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_a
> sian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_close_knit sck_age0_4 sck_age5_7 sck_age8_9 sck_age10_14 sck_age15
>  sck_age16_17 sck_age18_19 sck_age20_24 sck_age25_29 sck_age45_59 sck_age60_64 sck_age65_74 sck_age75_84
sck_age85_89 sck_age90over sck_male sck_ethnic_mixed sck_ethnic_asia
> n sck_ethnic_black sck_ethnic_other sck_country_europe sck_country_other sck_class1 sck_class2 sck_class3
sck_ses_students sck_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,416
-------------+----------------------------------   F(55, 1360)     =      8.80
       Model |  453.817998        55  8.25123633   Prob > F        =    0.0000
    Residual |  1275.02849     1,360  .937520948   R-squared       =    0.2625
-------------+----------------------------------   Adj R-squared   =    0.2327
       Total |  1728.84649     1,415  1.22179964   Root MSE        =    .96826

------------------------------------------------------------------------------------
       s_high_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
```

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-------------------+----------------------------------------------------------------
            age0_4 |  -.0373473   .0691084    -0.54   0.589                -.0335723
            age5_7 |  -.0552894     .05013    -1.10   0.270                -.0498553
            age8_9 |   -.076405   .0441223    -1.73   0.084                -.0687786
          age10_14 |  -.1071111   .0543267    -1.97   0.049                 -.097382
             age15 |   .0661428   .0353131     1.87   0.061                 .0597121
          age16_17 |  -.0840322   .0411645    -2.04   0.041                 -.073537
          age18_19 |  -.1381192   .0466923    -2.96   0.003                -.1225197
          age20_24 |  -.0025177   .0783838    -0.03   0.974                -.0023523
          age25_29 |  -.1116346   .0830939    -1.34   0.179                -.1048943
          age45_59 |   .0019121   .0611948     0.03   0.975                 .0017363
          age60_64 |   .0316142   .0623788     0.51   0.612                 .0285936
          age65_74 |  -.1076608   .0820368    -1.31   0.190                -.0956244
          age75_84 |   .0528471   .0701693     0.75   0.451                 .0464061
          age85_89 |   .0677386   .0604997     1.12   0.263                 .0610558
         age90over |   .1128119   .0474814     2.38   0.018                 .1010753
              male |   -.053089   .0327505    -1.62   0.105                -.0511437
      ethnic_mixed |   .1017799   .0408488     2.49   0.013                 .0980526
      ethnic_asian |  -.0569861   .0706669    -0.81   0.420                -.0614699
      ethnic_black |   .1247575   .0467585     2.67   0.008                 .1193603
      ethnic_other |  -.0120977   .0405618    -0.30   0.766                -.0114385
    country_europe |   .0273063   .0410999     0.66   0.507                 .0261148
     country_other |  -.0080743   .0968914    -0.08   0.934                 -.007897
            class1 |  -.1519452   .1552848    -0.98   0.328                -.2692898
            class2 |   -.013127   .0662723    -0.20   0.843                -.0231194
            class3 |  -.0877544   .0981737    -0.89   0.372                -.2274871
             ses_8 |   .3242872   .1139848     2.85   0.005                 .3279027
      ses_students |   .0144665   .1748646     0.08   0.934                 .0133214
 social_close_knit |   .0076787   .0276807     0.28   0.782                 .0069498
        sck_age0_4 |   .0171035   .0706997     0.24   0.809                 .0159134
        sck_age5_7 |  -.0588096   .0514347    -1.14   0.253                -.0537769
        sck_age8_9 |   .0668462    .042472     1.57   0.116                 .0616496
      sck_age10_14 |    .060511   .0538837     1.12   0.262                 .0572412
         sck_age15 |  -.0091917   .0358935    -0.26   0.798                -.0087527
      sck_age16_17 |  -.0154332   .0389051    -0.40   0.692                -.0148079
      sck_age18_19 |  -.1532506    .068229    -2.25   0.025                -.0925183
      sck_age20_24 |   .0563976   .0780993     0.72   0.470                 .0493834
      sck_age25_29 |  -.0131206   .0858609    -0.15   0.879                -.0127373
      sck_age45_59 |   .0237842   .0623225     0.38   0.703                 .0218719
      sck_age60_64 |  -.0184661   .0609079    -0.30   0.762                -.0171588
      sck_age65_74 |   .0483442   .0846689     0.57   0.568                 .0410956
      sck_age75_84 |  -.0066557   .0716457    -0.09   0.926                -.0054287
      sck_age85_89 |  -.0536659   .0576906    -0.93   0.352                -.0465734
     sck_age90over |   .0401668   .0456769     0.88   0.379                 .0361432
          sck_male |  -.0592315   .0323241    -1.83   0.067                -.0599309
  sck_ethnic_mixed |  -.0443122   .0396513    -1.12   0.264                -.0439554
  sck_ethnic_asian |    -.02011   .0730287    -0.28   0.783                -.0221847
  sck_ethnic_black |   .0191093   .0444407     0.43   0.667                 .0203658
  sck_ethnic_other |   .0515988   .0394328     1.31   0.191                 .0534365
sck_country_europe |  -.0338448   .0419057    -0.81   0.419                -.0332879
 sck_country_other |    .016145   .1037537     0.16   0.876                 .0164499
        sck_class1 |   .1865446   .1626243     1.15   0.252                 .3384793
        sck_class2 |   .0593717   .0698627     0.85   0.396                  .106321
        sck_class3 |   .1174225   .1030001     1.14   0.254                 .3062524
  sck_ses_students |   .2630823   .1777509     1.48   0.139                 .2148313
         sck_ses_8 |   .0857405   .1209243     0.71   0.478                 .0909035
             _cons |  -.0010472   .0271417    -0.04   0.969                        .
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. regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic
> _asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_close_knit sck_age0_4 sck_age5_7 sck_age8_9 sck_age10_14 sck_age
> 15 sck_age16_17 sck_age18_19 sck_age20_24 sck_age25_29 sck_age45_59 sck_age60_64 sck_age65_74 sck_age75_84
sck_age85_89 sck_age90over sck_male sck_ethnic_mixed sck_ethnic_as
> ian sck_ethnic_black sck_ethnic_other sck_country_europe sck_country_other sck_class1 sck_class2 sck_class3
sck_ses_students sck_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,389
-------------+----------------------------------   F(55, 1333)     =      9.02
       Model |  527.637045        55  9.59340081   Prob > F        =    0.0000
    Residual |  1417.52272     1,333  1.06340789   R-squared       =    0.2713
-------------+----------------------------------   Adj R-squared   =    0.2412
       Total |  1945.15976     1,388  1.40141193   Root MSE        =    1.0312

------------------------------------------------------------------------------------
     s_medium_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------------+----------------------------------------------------------------
            age0_4 |  -.0552204   .0743466    -0.74   0.458                -.0461389
            age5_7 |  -.0507403   .0538147    -0.94   0.346                 -.042717
            age8_9 |  -.0754176   .0472418    -1.60   0.111                -.0634433
          age10_14 |  -.0764572   .0584809    -1.31   0.191                -.0647405
             age15 |   .0515853   .0380807     1.35   0.176                  .043398
          age16_17 |  -.0550751   .0441156    -1.25   0.212                -.0451137
          age18_19 |   -.101449   .0499907    -2.03   0.043                -.0847104
          age20_24 |  -.0100681   .0842166    -0.12   0.905                -.0088204
          age25_29 |   .0232219    .089922     0.26   0.796                 .0203416
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         age45_59 |  -.0278371   .0657271    -0.42   0.672                -.0235777
         age60_64 |   .0022492   .0671081     0.03   0.973                 .0018967
         age65_74 |   .0193629   .0882253     0.22   0.826                 .0159767
         age75_84 |   .0165618    .075401     0.22   0.826                 .0135468
         age85_89 |   .0839532   .0650154     1.29   0.197                 .0706248
        age90over |   .2093132   .0510659     4.10   0.000                 .1752582
             male |  -.0309369   .0351168    -0.88   0.378                -.0279351
     ethnic_mixed |    .054893   .0437987     1.25   0.210                 .0494631
     ethnic_asian |  -.2286226   .0761298    -3.00   0.003                -.2320618
     ethnic_black |   .0213302   .0501228     0.43   0.670                 .0191612
     ethnic_other |  -.0364585   .0469079    -0.78   0.437                -.0304308
   country_europe |   .0371833    .044561     0.83   0.404                 .0333137
    country_other |   .0740716   .1041362     0.71   0.477                 .0678999
           class1 |  -.3389949   .1669125    -2.03   0.042                -.5616365
           class2 |   -.077547   .0711601    -1.09   0.276                 -.127696
           class3 |  -.2001465    .105576    -1.90   0.058                -.4825589
            ses_8 |   .2819882   .1229965     2.29   0.022                 .2665717
     ses_students |  -.1738084   .1879072    -0.92   0.355                -.1500666
 social_close_knit |   .0082542   .0298486     0.28   0.782                 .0069604
        sck_age0_4 |     .03434   .0762354     0.45   0.652                 .0297314
        sck_age5_7 |  -.0406189   .0553822    -0.73   0.463                -.0346719
        sck_age8_9 |   .0189109   .0456307     0.41   0.679                 .0163158
      sck_age10_14 |   .0388054   .0583678     0.66   0.506                 .0341894
         sck_age15 |  -.0359741   .0391303    -0.92   0.358                -.0317677
      sck_age16_17 |  -.0284445   .0419355    -0.68   0.498                -.0254994
      sck_age18_19 |  -.0739454   .0732896    -1.01   0.313                -.0419292
      sck_age20_24 |    .028727   .0841767     0.34   0.733                  .023626
      sck_age25_29 |  -.0319516   .0936307    -0.34   0.733                -.0288796
      sck_age45_59 |   .0595783   .0672641     0.89   0.376                 .0510987
      sck_age60_64 |  -.0533753   .0653555    -0.82   0.414                -.0463449
      sck_age65_74 |   .0644592   .0909413     0.71   0.479                 .0509082
      sck_age75_84 |  -.0393286   .0770955    -0.51   0.610                 -.029926
      sck_age85_89 |  -.0318026   .0622906    -0.51   0.610                -.0258226
     sck_age90over |  -.0013469     .04956    -0.03   0.978                -.0011284
          sck_male |  -.0932065   .0346919    -2.69   0.007                -.0883507
  sck_ethnic_mixed |  -.0435281   .0426273    -1.02   0.307                 -.040211
  sck_ethnic_asian |   .0097852   .0810319     0.12   0.904                  .010157
  sck_ethnic_black |   .0229383   .0485977     0.47   0.637                 .0229584
  sck_ethnic_other |   .0591379   .0422271     1.40   0.162                 .0564955
sck_country_europe |  -.0244611    .044933    -0.54   0.586                -.0226208
 sck_country_other |  -.0387421   .1155458    -0.34   0.737                -.0369651
        sck_class1 |   .2976234   .1762897     1.69   0.092                 .5035036
        sck_class2 |    .095386   .0756185     1.26   0.207                 .1593874
        sck_class3 |   .1717949   .1117493     1.54   0.124                 .4144921
  sck_ses_students |   .3383268   .1923991     1.76   0.079                 .2596608
         sck_ses_8 |   .1874783   .1316503     1.42   0.155                 .1851999
             _cons |   .0192794   .0291854     0.66   0.509                        .
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. regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_as
> ian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_close_knit sck_age0_4 sck_age5_7 sck_age8_9 sck_age10_14 sck_age15
> sck_age16_17 sck_age18_19 sck_age20_24 sck_age25_29 sck_age45_59 sck_age60_64 sck_age65_74 sck_age75_84
sck_age85_89 sck_age90over sck_male sck_ethnic_mixed sck_ethnic_asian
>  sck_ethnic_black sck_ethnic_other sck_country_europe sck_country_other sck_class1 sck_class2 sck_class3
sck_ses_students sck_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,416
-------------+----------------------------------   F(55, 1360)     =     10.01
       Model |  444.880966        55  8.08874484   Prob > F        =    0.0000
    Residual |  1099.50989     1,360  .808463151   R-squared       =    0.2881
-------------+----------------------------------   Adj R-squared   =    0.2593
       Total |  1544.39085     1,415   1.0914423   Root MSE        =    .89915

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        s_low_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------------+----------------------------------------------------------------
            age0_4 |  -.0403788   .0641756    -0.63   0.529                -.0384039
            age5_7 |  -.0402651   .0465519    -0.86   0.387                -.0384147
            age8_9 |  -.0263021    .040973    -0.64   0.521                -.0250508
          age10_14 |  -.1351485   .0504491    -2.68   0.007                -.1300035
             age15 |   .0481237   .0327926     1.47   0.142                 .0459662
          age16_17 |  -.0195587   .0382263    -0.51   0.609                -.0181092
          age18_19 |   -.097891   .0433595    -2.26   0.024                -.0918743
          age20_24 |   .0503723    .072789     0.69   0.489                 .0497948
          age25_29 |  -.0760607    .077163    -0.99   0.324                 -.075616
          age45_59 |  -.0584734   .0568269    -1.03   0.304                 -.056179
          age60_64 |  -.0013087   .0579264    -0.02   0.982                -.0012524
          age65_74 |  -.0733382   .0761813    -0.96   0.336                -.0689193
          age75_84 |   .0927044   .0651609     1.42   0.155                 .0861298
          age85_89 |    .136621   .0561814     2.43   0.015                  .130289
         age90over |   .1139165   .0440923     2.58   0.010                 .1079883
              male |  -.0700158   .0304129    -2.30   0.021                -.0713646
      ethnic_mixed |  -.0382813   .0379332    -1.01   0.313                -.0390196
      ethnic_asian |   -.167805    .065623    -2.56   0.011                -.1915129
      ethnic_black |   .0815762    .043421     1.88   0.060                 .0825765
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     ethnic_other |  -.0580379   .0376667    -1.54   0.124                -.0580599
   country_europe |    .068512   .0381663     1.80   0.073                  .069325
    country_other |   .0814238   .0899756     0.90   0.366                  .084257
           class1 |  -.3131129   .1442011    -2.17   0.030                -.5871287
           class2 |  -.0708098    .061542    -1.15   0.250                 -.131948
           class3 |  -.1864126   .0911664    -2.04   0.041                -.5112849
            ses_8 |   .1614852    .105849     1.53   0.127                 .1727618
     ses_students |  -.2388042   .1623833    -1.47   0.142                -.2326636
social_close_knit |  -.0117481   .0257049    -0.46   0.648                  -.01125
      sck_age0_4 |  -.0280591   .0656534    -0.43   0.669                -.0276217
      sck_age5_7 |  -.0269192   .0477635    -0.56   0.573                -.0260441
      sck_age8_9 |   .0538362   .0394405     1.36   0.172                 .0525324
     sck_age10_14 |   .0277136   .0500377     0.55   0.580                 .0277375
       sck_age15 |   .0032732   .0333315     0.10   0.922                 .0032978
     sck_age16_17 |  -.0285865   .0361282    -0.79   0.429                  -.02902
     sck_age18_19 |  -.0742285    .063359    -1.17   0.242                -.0474128
     sck_age20_24 |  -.0442608   .0725249    -0.61   0.542                -.0410053
     sck_age25_29 |   .0215984   .0797325     0.27   0.787                 .0221843
     sck_age45_59 |  -.0416037   .0578742    -0.72   0.472                -.0404791
     sck_age60_64 |  -.0223956   .0565605    -0.40   0.692                -.0220178
     sck_age65_74 |   .0670562   .0786256     0.85   0.394                 .0603099
     sck_age75_84 |  -.0428821   .0665319    -0.64   0.519                -.0370062
     sck_age85_89 |  -.1005333   .0535728    -1.88   0.061                -.0923102
    sck_age90over |   .0660091   .0424166     1.56   0.120                 .0628438
         sck_male |  -.0532699   .0300169    -1.77   0.076                -.0570269
 sck_ethnic_mixed |  -.0423539   .0368211    -1.15   0.250                 -.044451
 sck_ethnic_asian |  -.0149234   .0678162    -0.22   0.826                -.0174185
 sck_ethnic_black |   .0171012   .0412687     0.41   0.679                 .0192833
 sck_ethnic_other |   .0176393   .0366182     0.48   0.630                 .0193277
sck_country_europe |  -.0603481   .0389146    -1.55   0.121                -.0627998
 sck_country_other |    .036909   .0963481     0.38   0.702                 .0397883
       sck_class1 |   .0603061   .1510167     0.40   0.690                 .1157739
       sck_class2 |   .0053731   .0648762     0.08   0.934                 .0101805
       sck_class3 |   .0393221   .0956483     0.41   0.681                 .1085088
 sck_ses_students |   .1172917   .1650637     0.71   0.477                 .1013381
        sck_ses_8 |  -.0162033   .1122931    -0.14   0.885                 -.018176
            _cons |   .0078899   .0252044     0.31   0.754                        .
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. regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_
> asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_help social_help_age0_4 social_help_age5_7 social_help_age8_9 soc
> ial_help_age10_14 social_help_age15 social_help_age16_17 social_help_age18_19 social_help_age20_24
social_help_age25_29 social_help_age45_59 social_help_age60_64 social_help
> _age65_74 social_help_age75_84 social_help_age85_89 social_help_age90over social_help_male
social_help_ethnic_mixed social_help_ethnic_asian social_help_ethnic_black social_
> help_ethnic_other social_help_country_europe social_help_country_other social_help_class1
social_help_class2 social_help_class3 social_help_ses_students social_help_country_
> ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,416
-------------+----------------------------------   F(55, 1360)     =      9.82
       Model |  510.008174        55  9.27287589   Prob > F        =    0.0000
    Residual |  1284.32621     1,360  .944357506   R-squared       =    0.2842
-------------+----------------------------------   Adj R-squared   =    0.2553
       Total |  1794.33438     1,415  1.26808084   Root MSE        =    .97178

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             s_total_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
--------------------------+----------------------------------------------------------------
                   age0_4 |   -.060093   .0691551    -0.87   0.385                 -.053024
                   age5_7 |  -.0446832   .0503852    -0.89   0.375                -.0395494
                   age8_9 |  -.0587623   .0440985    -1.33   0.183                -.0519227
                 age10_14 |  -.1263553    .054448    -2.32   0.020                -.1127624
                    age15 |   .0565141    .035476     1.59   0.111                 .0500798
                 age16_17 |  -.0632592   .0411624    -1.54   0.125                -.0543389
                 age18_19 |  -.0846277   .0529531    -1.60   0.110                 -.073687
                 age20_24 |     .02133   .0786763     0.27   0.786                 .0195618
                 age25_29 |  -.0911309   .0835201    -1.09   0.275                -.0840516
                 age45_59 |  -.0225799    .061422    -0.37   0.713                -.0201263
                 age60_64 |   .0197887   .0625164     0.32   0.752                 .0175683
                 age65_74 |  -.0840289   .0824894    -1.02   0.309                -.0732599
                 age75_84 |   .0867363   .0705247     1.23   0.219                  .074762
                 age85_89 |   .0992112   .0605594     1.64   0.102                 .0877764
                age90over |   .1353948   .0475182     2.85   0.004                 .1190746
                     male |  -.0560587   .0327204    -1.71   0.087                  -.05301
             ethnic_mixed |   .0317661   .0419305     0.76   0.449                 .0300392
             ethnic_asian |  -.2021738   .0688298    -2.94   0.003                -.2140646
             ethnic_black |   .0912967   .0477502     1.91   0.056                 .0857384
             ethnic_other |  -.0543207   .0410224    -1.32   0.186                -.0504147
           country_europe |   .0557895   .0402681     1.39   0.166                 .0523724
            country_other |   .1274357   .0944377     1.35   0.177                 .1223411
                   class1 |  -.2331175   .1563429    -1.49   0.136                -.4055404
                   class2 |  -.0377047   .0666967    -0.57   0.572                -.0651827
                   class3 |  -.1456599   .0987949    -1.47   0.141                 -.370642
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                   ses_8 |   .3206283   .1142859     2.81   0.005                  .3182319
            ses_students |  -.1242413   .1753017    -0.71   0.479                   -.1123
             social_help |    .004653   .0279839     0.17   0.868                  .0041343
      social_help_age0_4 |  -.0348595    .072492    -0.48   0.631                 -.0328734
      social_help_age5_7 |  -.0206325    .051096    -0.40   0.686                 -.0188955
      social_help_age8_9 |    .041869   .0455954     0.92   0.359                  .0370119
    social_help_age10_14 |   .0243889   .0536953     0.45   0.650                  .0218453
       social_help_age15 |   .0259079   .0360737     0.72   0.473                  .0238816
    social_help_age16_17 |  -.0323042   .0418367    -0.77   0.440                 -.0277905
    social_help_age18_19 |  -.1385517   .0628275    -2.21   0.028                 -.0980158
    social_help_age20_24 |  -.0781629   .0821967    -0.95   0.342                 -.0709707
    social_help_age25_29 |   .0105109   .0871153     0.12   0.904                  .0099822
    social_help_age45_59 |  -.0117104   .0642697    -0.18   0.855                 -.0107806
    social_help_age60_64 |  -.1093234   .0629143    -1.74   0.082                 -.1005425
    social_help_age65_74 |   .0943677   .0839533     1.12   0.261                  .0777938
    social_help_age75_84 |  -.0749921   .0710177    -1.06   0.291                 -.0596257
    social_help_age85_89 |  -.0506249   .0569417    -0.89   0.374                 -.0420888
  social_help_age90over |   .0685543   .0482397     1.42   0.156                   .058512
        social_help_male |  -.0314603   .0362352    -0.87   0.385                 -.0282085
social_help_ethnic_mixed |    -.05766   .0410359    -1.41   0.160                 -.0603148
social_help_ethnic_asian |  -.0010355   .0690105    -0.02   0.988                 -.0012635
social_help_ethnic_black |   .0424401   .0441839     0.96   0.337                   .049564
social_help_ethnic_other |   .0143256   .0413623     0.35   0.729                  .0144194
social_help_country_europe |  -.0578039   .0408778    -1.41   0.158                 -.0618013
social_help_country_other |  -.0693728   .0954304    -0.73   0.467                  -.077418
      social_help_class1 |   .2786711   .1623516     1.72   0.086                  .4986042
      social_help_class2 |   .1056816   .0692328     1.53   0.127                  .1954186
      social_help_class3 |   .1810235   .1025003     1.77   0.078                  .4570449
social_help_ses_students |   .4686371   .1793127     2.61   0.009                  .4130094
social_help_country_ses_8 |   .2062242    .118791     1.74   0.083                  .2363474
                   _cons |   .0049391   .0271416     0.18   0.856                         .
------------------------------------------------------------------------------------------

. regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_a
> sian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_help social_help_age0_4 social_help_age5_7 social_help_age8_9 soci
> al_help_age10_14 social_help_age15 social_help_age16_17 social_help_age18_19 social_help_age20_24
social_help_age25_29 social_help_age45_59 social_help_age60_64 social_help_
> age65_74 social_help_age75_84 social_help_age85_89 social_help_age90over social_help_male
social_help_ethnic_mixed social_help_ethnic_asian social_help_ethnic_black social_h
> elp_ethnic_other social_help_country_europe social_help_country_other social_help_class1 social_help_class2
social_help_class3 social_help_ses_students social_help_country_s
> es_8, b

      Source |       SS           df       MS      Number of obs   =     1,416
-------------+----------------------------------   F(55, 1360)     =      8.85
       Model |  455.799505        55  8.28726372   Prob > F        =    0.0000
    Residual |  1273.04698     1,360  .936063958   R-squared       =    0.2636
-------------+----------------------------------   Adj R-squared   =    0.2339
       Total |  1728.84649     1,415  1.22179964   Root MSE        =     .9675

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             s_high_jnsn |      Coef.   Std. Err.      t    P>|t|                      Beta
-------------------------+----------------------------------------------------------------
                  age0_4 |  -.0389488   .0688508    -0.57   0.572                 -.0350119
                  age5_7 |  -.0545636   .0501635    -1.09   0.277                 -.0492008
                  age8_9 |  -.0730261   .0439045    -1.66   0.096                  -.065737
                age10_14 |  -.1075399   .0542084    -1.98   0.047                 -.0977718
                   age15 |   .0622327   .0353199     1.76   0.078                  .0561821
                age16_17 |  -.0881423   .0409812    -2.15   0.032                 -.0771338
                age18_19 |  -.0788419     .05272    -1.50   0.135                 -.0699373
                age20_24 |  -.0186416   .0783301    -0.24   0.812                 -.0174171
                age25_29 |  -.1099963   .0831526    -1.32   0.186                  -.103355
                age45_59 |    .002245   .0611517     0.04   0.971                  .0020386
                age60_64 |   .0266195   .0622413     0.43   0.669                  .0240761
                age65_74 |  -.1118462   .0821264    -1.36   0.173                 -.0993419
                age75_84 |   .0645935   .0702144     0.92   0.358                  .0567208
                age85_89 |   .0616673   .0602928     1.02   0.307                  .0555834
               age90over |   .1209141   .0473091     2.56   0.011                  .1083347
                    male |  -.0491581   .0325764    -1.51   0.132                 -.0473568
            ethnic_mixed |   .0959685    .041746     2.30   0.022                  .0924541
            ethnic_asian |  -.0779712   .0685269    -1.14   0.255                 -.0841062
            ethnic_black |   .1403037   .0475401     2.95   0.003                   .134234
            ethnic_other |  -.0171078   .0408418    -0.42   0.675                 -.0161755
          country_europe |   .0242397   .0400909     0.60   0.546                   .023182
           country_other |   .0108233   .0940221     0.12   0.908                  .0105856
                  class1 |  -.1158538   .1556549    -0.74   0.457                 -.2053256
                  class2 |   .0037572   .0664032     0.06   0.955                  .0066171
                  class3 |  -.0688839   .0983601    -0.70   0.484                  -.178569
                   ses_8 |   .3655183   .1137829     3.21   0.001                  .3695935
            ses_students |    .030506   .1745302     0.17   0.861                  .0280913
             social_help |    .003701   .0278608     0.13   0.894                  .0033502
      social_help_age0_4 |    -.02469    .072173    -0.34   0.732                 -.0237202
      social_help_age5_7 |  -.0087778   .0508712    -0.17   0.863                 -.0081897
      social_help_age8_9 |   .0339545   .0453947     0.75   0.455                  .0305788
    social_help_age10_14 |   .0428639    .053459     0.80   0.423                  .0391138
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       social_help_age15 |   .0121416   .0359149     0.34   0.735                     .011402
    social_help_age16_17 |  -.0312147   .0416525    -0.75   0.454                   -.0273571
    social_help_age18_19 |  -.1463268    .062551    -2.34   0.019                   -.1054586
    social_help_age20_24 |  -.0273542    .081835    -0.33   0.738                   -.0253032
    social_help_age25_29 |  -.0002258   .0867319    -0.00   0.998                   -.0002184
    social_help_age45_59 |   .0130735   .0639868     0.20   0.838                    .0122613
    social_help_age60_64 |  -.1040882   .0626375    -1.66   0.097                   -.0975241
    social_help_age65_74 |    .100482   .0835839     1.20   0.230                    .0843885
    social_help_age75_84 |  -.0674541   .0707052    -0.95   0.340                   -.0546386
    social_help_age85_89 |  -.0199078   .0566912    -0.35   0.726                   -.0168616
   social_help_age90over |   .0529469   .0480274     1.10   0.270                    .0460388
        social_help_male |  -.0320614   .0360758    -0.89   0.374                    -.029287
social_help_ethnic_mixed |   -.059506   .0408553    -1.46   0.145                   -.0634138
social_help_ethnic_asian |   .0059232   .0687068     0.09   0.931                    .0073631
social_help_ethnic_black |   .0575212   .0439894     1.31   0.191                    .0684369
social_help_ethnic_other |   .0216869   .0411803     0.53   0.599                    .0222385
social_help_country_europe |  -.0367241   .0406979    -0.90   0.367                 -.0400005
social_help_country_other |  -.0740307   .0950105    -0.78   0.436                  -.0841663
      social_help_class1 |   .2828096   .1616371     1.75   0.080                    .5155034
      social_help_class2 |   .1126402   .0689281     1.63   0.102                    .2121942
      social_help_class3 |   .1870791   .1020492     1.83   0.067                    .4811967
social_help_ses_students |    .443134   .1785235     2.48   0.013                    .3978614
social_help_country_ses_8 |   .2002146   .1182683     1.69   0.091                    .2337655
                   _cons |   .0064291   .0270222     0.24   0.812                           .
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. regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic
> _asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_help social_help_age0_4 social_help_age5_7 social_help_age8_9 so
> cial_help_age10_14 social_help_age15 social_help_age16_17 social_help_age18_19 social_help_age20_24
social_help_age25_29 social_help_age45_59 social_help_age60_64 social_hel
> p_age65_74 social_help_age75_84 social_help_age85_89 social_help_age90over social_help_male
social_help_ethnic_mixed social_help_ethnic_asian social_help_ethnic_black social
> _help_ethnic_other social_help_country_europe social_help_country_other social_help_class1
social_help_class2 social_help_class3 social_help_ses_students social_help_country
> _ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,389
-------------+----------------------------------   F(55, 1333)     =      9.16
       Model |  533.324958        55  9.69681742   Prob > F        =    0.0000
    Residual |  1411.83481     1,333  1.05914089   R-squared       =    0.2742
-------------+----------------------------------   Adj R-squared   =    0.2442
       Total |  1945.15976     1,388  1.40141193   Root MSE        =    1.0291

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           s_medium_jnsn |      Coef.   Std. Err.      t    P>|t|                       Beta
-------------------------+------------------------------------------------------------------
                  age0_4 |  -.0669518   .0740868    -0.90   0.366                   -.0559409
                  age5_7 |  -.0497567    .053771    -0.93   0.355                   -.0418889
                  age8_9 |  -.0760955   .0469772    -1.62   0.106                   -.0640136
                age10_14 |  -.0791625   .0583028    -1.36   0.175                   -.0670313
                   age15 |   .0488987    .037971     1.29   0.198                    .0411378
                age16_17 |  -.0682792   .0438846    -1.56   0.120                   -.0559296
                age18_19 |  -.0719632   .0564434    -1.27   0.203                   -.0600896
                age20_24 |  -.0372279   .0840097    -0.44   0.658                   -.0326142
                age25_29 |   .0134116   .0897336     0.15   0.881                    .0117482
                age45_59 |  -.0347508   .0655917    -0.53   0.596                   -.0294336
                age60_64 |  -.0055083   .0668443    -0.08   0.934                   -.0046452
                age65_74 |   .0121122   .0882135     0.14   0.891                     .009994
                age75_84 |   .0204485   .0753989     0.27   0.786                     .016726
                age85_89 |    .069219      .0647     1.07   0.285                    .0582297
               age90over |   .2136945   .0507786     4.21   0.000                    .1789267
                    male |   -.022369   .0348867    -0.64   0.522                   -.0201986
            ethnic_mixed |   .0404604   .0446675     0.91   0.365                    .0364582
            ethnic_asian |  -.2520268   .0741763    -3.40   0.001                   -.2558181
            ethnic_black |   .0307495   .0511073     0.60   0.547                    .0276227
            ethnic_other |  -.0409846   .0476298    -0.86   0.390                   -.0342086
          country_europe |   .0307763   .0434564     0.71   0.479                    .0275735
           country_other |   .1040148   .1018864     1.02   0.307                    .0953481
                  class1 |  -.3113811   .1672034    -1.86   0.063                   -.5158868
                  class2 |   -.065102     .07123    -0.91   0.361                    -.107203
                  class3 |  -.1865383   .1057004    -1.76   0.078                   -.4497492
                   ses_8 |   .3217534   .1226747     2.62   0.009                    .3041629
            ses_students |  -.1505614   .1873645    -0.80   0.422                   -.1299951
             social_help |  -.0250213   .0301712    -0.83   0.407                   -.0210052
      social_help_age0_4 |  -.0387305    .078465    -0.49   0.622                    -.034569
      social_help_age5_7 |   .0053105   .0552391     0.10   0.923                    .0046159
      social_help_age8_9 |   .0002366   .0486659     0.00   0.996                    .0001985
    social_help_age10_14 |  -.0193683   .0581787    -0.33   0.739                   -.0162635
       social_help_age15 |  -.0180619   .0396232    -0.46   0.649                   -.0155054
    social_help_age16_17 |   -.021533   .0448168    -0.48   0.631                   -.0175218
    social_help_age18_19 |  -.1376171   .0672864    -2.05   0.041                   -.0932488
    social_help_age20_24 |  -.0734797   .0880281    -0.83   0.404                   -.0638714
    social_help_age25_29 |  -.0217591   .0952941    -0.23   0.819                   -.0196451
    social_help_age45_59 |  -.0020094   .0698362    -0.03   0.977                   -.0017568
    social_help_age60_64 |  -.1879684   .0675506    -2.78   0.005                   -.1640493
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     social_help_age65_74 |   .0827359   .0899994     0.92   0.358                    .0645169
     social_help_age75_84 |  -.0525133   .0760939    -0.69   0.490                   -.0395964
     social_help_age85_89 |   -.016071   .0613749    -0.26   0.793                   -.0127175
    social_help_age90over |    .016079   .0518762     0.31   0.757                    .0130164
         social_help_male |  -.0474344   .0386878    -1.23   0.220                   -.0404649
  social_help_ethnic_mixed |  -.0437929   .0440889    -0.99   0.321                      -.0433
  social_help_ethnic_asian |   .0154404   .0737455     0.21   0.834                    .0180522
  social_help_ethnic_black |   .0369497   .0469899     0.79   0.432                    .0412033
  social_help_ethnic_other |   .0067005   .0439636     0.15   0.879                    .0063748
social_help_country_europe |  -.0596354   .0435399    -1.37   0.171                    -.061037
 social_help_country_other |  -.0964842   .1016413    -0.95   0.343                   -.1028433
        social_help_class1 |   .2119154   .1772843     1.20   0.232                    .3576378
        social_help_class2 |   .1055569    .075149     1.40   0.160                    .1843949
        social_help_class3 |   .1241576   .1121623     1.11   0.269                    .2913614
  social_help_ses_students |   .4111421   .1952907     2.11   0.035                    .3473325
 social_help_country_ses_8 |   .2139968   .1299246     1.65   0.100                    .2325178
                     _cons |   .0287653   .0290171     0.99   0.322                           .
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. regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_as
> ian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_help social_help_age0_4 social_help_age5_7 social_help_age8_9 socia
> l_help_age10_14 social_help_age15 social_help_age16_17 social_help_age18_19 social_help_age20_24
social_help_age25_29 social_help_age45_59 social_help_age60_64 social_help_a
> ge65_74 social_help_age75_84 social_help_age85_89 social_help_age90over social_help_male
social_help_ethnic_mixed social_help_ethnic_asian social_help_ethnic_black social_he
> lp_ethnic_other social_help_country_europe social_help_country_other social_help_class1 social_help_class2
social_help_class3 social_help_ses_students social_help_country_se
> s_8, b

      Source |       SS           df       MS      Number of obs   =     1,416
-------------+----------------------------------   F(55, 1360)     =     10.21
       Model |  451.436645        55    8.207939   Prob > F        =    0.0000
    Residual |  1092.95421     1,360  .803642798   R-squared       =    0.2923
-------------+----------------------------------   Adj R-squared   =    0.2637
       Total |  1544.39085     1,415   1.0914423   Root MSE        =    .89646

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                s_low_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
---------------------------+----------------------------------------------------------------
                    age0_4 |  -.0400432   .0637952    -0.63   0.530                   -.0380847
                    age5_7 |  -.0452672   .0464801    -0.97   0.330                    -.043187
                    age8_9 |  -.0194741   .0406806    -0.48   0.632                   -.0185476
                  age10_14 |  -.1409121   .0502279    -2.81   0.005                   -.1355477
                     age15 |   .0491312   .0327264     1.50   0.134                    .0469285
                  age16_17 |  -.0261912    .037972    -0.69   0.490                   -.0242502
                  age18_19 |  -.0600515   .0488489    -1.23   0.219                   -.0563605
                  age20_24 |   .0357092   .0725784     0.49   0.623                    .0352998
                  age25_29 |  -.0797323   .0770468    -1.03   0.301                   -.0792661
                  age45_59 |  -.0600434   .0566614    -1.06   0.289                   -.0576873
                  age60_64 |  -.0067877    .057671    -0.12   0.906                   -.0064954
                  age65_74 |  -.0789685    .076096    -1.04   0.300                   -.0742103
                  age75_84 |    .099498   .0650586     1.53   0.126                    .0924416
                  age85_89 |   .1391788   .0558656     2.49   0.013                    .1327283
                 age90over |   .1133535   .0438352     2.59   0.010                    .1074546
                      male |  -.0659046   .0301844    -2.18   0.029                   -.0671743
              ethnic_mixed |  -.0398314   .0386806    -1.03   0.303                   -.0405997
              ethnic_asian |  -.1842802    .063495    -2.90   0.004                   -.2103157
              ethnic_black |   .0853028   .0440493     1.94   0.053                    .0863488
              ethnic_other |  -.0529705   .0378429    -1.40   0.162                   -.0529906
            country_europe |   .0616023   .0371471     1.66   0.097                    .0623333
             country_other |   .0907361   .0871181     1.04   0.298                    .0938933
                    class1 |  -.2892035   .1442253    -2.01   0.045                   -.5422954
                    class2 |  -.0605293   .0615273    -0.98   0.325                   -.1127913
                    class3 |   -.174903   .0911376    -1.92   0.055                   -.4797167
                     ses_8 |   .1985587    .105428     1.88   0.060                     .212424
              ses_students |  -.2251293   .1617147    -1.39   0.164                   -.2193403
               social_help |   -.013405    .025815    -0.52   0.604                   -.0128385
        social_help_age0_4 |  -.0552781   .0668734    -0.83   0.409                   -.0561888
        social_help_age5_7 |  -.0173815   .0471358    -0.37   0.712                   -.0171581
        social_help_age8_9 |    .031676   .0420615     0.75   0.452                    .0301823
      social_help_age10_14 |   .0246143   .0495336     0.50   0.619                    .0237644
         social_help_age15 |   .0350817   .0332777     1.05   0.292                    .0348565
      social_help_age16_17 |  -.0455139    .038594    -1.18   0.238                   -.0422041
      social_help_age18_19 |  -.1276319   .0579579    -2.20   0.028                   -.0973233
      social_help_age20_24 |  -.0840456   .0758259    -1.11   0.268                   -.0822557
      social_help_age25_29 |   .0132727   .0803633     0.17   0.869                    .0135869
      social_help_age45_59 |   -.046451   .0592884    -0.78   0.433                   -.0460934
      social_help_age60_64 |  -.0642892   .0580381    -1.11   0.268                   -.0637306
      social_help_age65_74 |   .0639178   .0774464     0.83   0.409                    .0567958
      social_help_age75_84 |  -.0921921   .0655134    -1.41   0.160                   -.0790105
      social_help_age85_89 |  -.0676639   .0525284    -1.29   0.198                   -.0606362
     social_help_age90over |    .069663   .0445008     1.57   0.118                    .0640894
          social_help_male |   -.016889   .0334268    -0.51   0.613                   -.0163228
  social_help_ethnic_mixed |   -.046359   .0378554    -1.22   0.221                   -.0522705
  social_help_ethnic_asian |   .0013334   .0636617     0.02   0.983                    .0017537
```

```
  social_help_ethnic_black |   .0292552   .0407593     0.72   0.473                     .0368269
  social_help_ethnic_other |    .000194   .0381565     0.01   0.996                     .0002104
social_help_country_europe |  -.0780793   .0377095    -2.07   0.039                    -.0899807
 social_help_country_other |  -.0427766    .088034    -0.49   0.627                    -.0514555
        social_help_class1 |   .1963637   .1497683     1.31   0.190                     .3787026
        social_help_class2 |   .0586793   .0638668     0.92   0.358                     .1169567
        social_help_class3 |   .1264728   .0945559     1.34   0.181                     .3441865
  social_help_ses_students |   .3453078   .1654148     2.09   0.037                     .3280218
 social_help_country_ses_8 |   .1324729    .109584     1.21   0.227                     .1636483
                     _cons |   .0161211    .025038     0.64   0.520                            .
--------------------------------------------------------------------------------------------

.
. regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_
> asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_friends social_friends_age0_4 social_friends_age5_7 social_friend
> s_age8_9 social_friends_age10_14 social_friends_age15 social_friends_age16_17 social_friends_age18_19
social_friends_age20_24 social_friends_age25_29 social_friends_age45_59
>  social_friends_age60_64 social_friends_age65_74 social_friends_age75_84 social_friends_age85_89
social_friends_age90over social_friends_male social_friends_ethnic_mixed soc
> ial_friends_ethnic_asian social_friends_ethnic_black social_friends_ethnic_other
social_friends_country_europe social_friends_country_other social_friends_class1 social_frie
> nds_class2 social_friends_class3 social_friends_ses_students social_friends_country_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,277
-------------+----------------------------------   F(55, 1221)     =      8.24
       Model |  428.390622        55  7.7889204   Prob > F        =    0.0000
    Residual |  1154.04359     1,221  .945162649   R-squared       =    0.2707
-------------+----------------------------------   Adj R-squared   =    0.2379
       Total |  1582.43422     1,276  1.24015221   Root MSE        =    .97219

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                 s_total_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
------------------------------+----------------------------------------------------------------
                       age0_4 |  -.1580162   .0725728    -2.18   0.030                    -.1395506
                       age5_7 |  -.0302919   .0536494    -0.56   0.572                    -.0265406
                       age8_9 |  -.0984117   .0470709    -2.09   0.037                    -.0854592
                     age10_14 |  -.1273523   .0567466    -2.24   0.025                    -.1119553
                        age15 |  -.0089597   .0376602    -0.24   0.812                     -.008041
                     age16_17 |  -.0623963   .0437622    -1.43   0.154                    -.0528807
                     age18_19 |  -.0889541   .0764362    -1.16   0.245                    -.0499927
                     age20_24 |  -.0126142   .0835435    -0.15   0.880                     -.010886
                     age25_29 |  -.1615259   .0925426    -1.75   0.081                    -.1486798
                     age45_59 |  -.0635453    .064637    -0.98   0.326                    -.0563618
                     age60_64 |  -.0544128   .0654544    -0.83   0.406                    -.0488168
                     age65_74 |  -.0685267   .0855015    -0.80   0.423                    -.0608665
                     age75_84 |   .0560208   .0741429     0.76   0.450                     .0491526
                     age85_89 |   .0666853   .0635321     1.05   0.294                     .0593524
                    age90over |   .1159473   .0502937     2.31   0.021                     .1023589
                         male |  -.0622505   .0370032    -1.68   0.093                     -.055983
                 ethnic_mixed |   .0397146   .0433123     0.92   0.359                     .0376011
                 ethnic_asian |  -.1238981    .065455    -1.89   0.059                    -.1292425
                 ethnic_black |   .1403698   .0475357     2.95   0.003                     .1256347
                 ethnic_other |  -.0452171   .0398742    -1.13   0.257                    -.0423455
               country_europe |   .0804093    .046503     1.73   0.084                     .0724851
                country_other |  -.0265399   .0770366    -0.34   0.731                    -.0255975
                       class1 |  -.3935872   .1700468    -2.31   0.021                    -.6863962
                       class2 |  -.1111197   .0714322    -1.56   0.120                    -.1908946
                       class3 |  -.2609067   .1073683    -2.43   0.015                    -.6655248
                        ses_8 |   .2703698   .1252772     2.16   0.031                     .2600442
                 ses_students |  -.2844046   .1919661    -1.48   0.139                    -.2250711
               social_friends |  -.0100943   .0508336    -0.20   0.843                    -.0090644
        social_friends_age0_4 |   .0844451   .1159902     0.73   0.467                     .0677863
        social_friends_age5_7 |   .1056995   .1060123     1.00   0.319                     .0758839
        social_friends_age8_9 |  -.0537308   .0911144    -0.59   0.555                     -.037097
      social_friends_age10_14 |  -.0737175   .1079622    -0.68   0.495                    -.0688516
         social_friends_age15 |  -.0374206   .0770445    -0.49   0.627                    -.0348424
      social_friends_age16_17 |    .028732   .0805833     0.36   0.721                     .0230845
      social_friends_age18_19 |    .328779   .1538854     2.14   0.033                     .1906609
      social_friends_age20_24 |   .0835083   .1867393     0.45   0.655                     .0491347
      social_friends_age25_29 |  -.1104976   .1651751    -0.67   0.504                    -.0960136
      social_friends_age45_59 |  -.0218062    .113389    -0.19   0.848                    -.0179422
      social_friends_age60_64 |  -.1182307   .1208874    -0.98   0.328                    -.1178217
      social_friends_age65_74 |   .2514356   .1605305     1.57   0.118                     .2370557
      social_friends_age75_84 |  -.0008863   .1336434    -0.01   0.995                    -.0004839
      social_friends_age85_89 |   .0709112    .126475     0.56   0.575                     .0474249
     social_friends_age90over |  -.0755586   .0944892    -0.80   0.424                    -.0673628
          social_friends_male |   .1065772   .0672335     1.59   0.113                     .0778151
  social_friends_ethnic_mixed |  -.0479218   .0809169    -0.59   0.554                     -.033831
  social_friends_ethnic_asian |  -.1255119   .1236895    -1.01   0.310                      -.06897
  social_friends_ethnic_black |   .1064545   .0931544     1.14   0.253                     .0651138
  social_friends_ethnic_other |   -.101246   .0800741    -1.26   0.206                    -.0551049
social_friends_country_europe |   .1352854   .0889692     1.52   0.129                       .06423
 social_friends_country_other |   .0976372   .1314119     0.74   0.458                     .0547445
        social_friends_class1 |   -.177814   .3026568    -0.59   0.557                     -.249591
        social_friends_class2 |   -.030226   .1225197    -0.25   0.805                    -.0344634
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       social_friends_class3 |  -.1931534   .1920157    -1.01   0.315                    -.3448135
  social_friends_ses_students |  -.5275475   .3486328    -1.51   0.130                    -.2943393
 social_friends_country_ses_8 |   .0487342   .2296127     0.21   0.832                     .0311572
                        _cons |   .0051036   .0281406     0.18   0.856                            .
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. regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_a
> sian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_friends social_friends_age0_4 social_friends_age5_7 social_friends
> _age8_9 social_friends_age10_14 social_friends_age15 social_friends_age16_17 social_friends_age18_19
social_friends_age20_24 social_friends_age25_29 social_friends_age45_59
> social_friends_age60_64 social_friends_age65_74 social_friends_age75_84 social_friends_age85_89
social_friends_age90over social_friends_male social_friends_ethnic_mixed soci
> al_friends_ethnic_asian social_friends_ethnic_black social_friends_ethnic_other
social_friends_country_europe social_friends_country_other social_friends_class1 social_frien
> ds_class2 social_friends_class3 social_friends_ses_students social_friends_country_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,277
-------------+----------------------------------   F(55, 1221)     =      7.95
       Model |  395.015692        55  7.18210348   Prob > F        =    0.0000
    Residual |  1102.49344     1,221  .902943032   R-squared       =    0.2638
-------------+----------------------------------   Adj R-squared   =    0.2306
       Total |  1497.50913     1,276   1.1735965   Root MSE        =    .95023

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                  s_high_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
------------------------------+----------------------------------------------------------------
                       age0_4 |  -.1362169   .0709334    -1.92   0.055                    -.1236628
                       age5_7 |  -.0527467   .0524375    -1.01   0.315                    -.0475071
                       age8_9 |  -.0997383   .0460076    -2.17   0.030                    -.0890332
                     age10_14 |  -.1130898   .0554647    -2.04   0.042                    -.1021973
                        age15 |    .011318   .0368094     0.31   0.759                     .0104416
                     age16_17 |   -.074781   .0427736    -1.75   0.081                    -.0651491
                     age18_19 |  -.1224543   .0747095    -1.64   0.101                    -.0707445
                     age20_24 |  -.0246883   .0816563    -0.30   0.762                    -.0219017
                     age25_29 |  -.1924756   .0904521    -2.13   0.034                    -.1821225
                     age45_59 |  -.0600886   .0631768    -0.95   0.342                    -.0547862
                     age60_64 |  -.0641475   .0639758    -1.00   0.316                    -.0591597
                     age65_74 |  -.0838518     .08357    -1.00   0.316                    -.0765613
                     age75_84 |   .0102497    .072468     0.14   0.888                     .0092446
                     age85_89 |   .0353206   .0620969     0.57   0.570                     .0323158
                    age90over |   .1103493   .0491576     2.24   0.025                     .1001412
                         male |  -.0582654   .0361673    -1.61   0.107                    -.0538644
                 ethnic_mixed |   .0880761   .0423339     2.08   0.038                     .0857208
                 ethnic_asian |  -.0271435   .0639763    -0.42   0.671                    -.0291061
                 ethnic_black |   .1919482   .0464619     4.13   0.000                     .1766031
                 ethnic_other |  -.0248189   .0389735    -0.64   0.524                    -.0238927
               country_europe |   .0393489   .0454525     0.87   0.387                     .0364631
                country_other |  -.1049267   .0752964    -1.39   0.164                    -.1040309
                       class1 |  -.3008224   .1662054    -1.81   0.071                    -.5392898
                       class2 |  -.0743808   .0698185    -1.07   0.287                    -.1313535
                       class3 |  -.1985974   .1049429    -1.89   0.059                    -.5207516
                        ses_8 |   .3032555   .1224473     2.48   0.013                     .2998305
                 ses_students |   -.154619   .1876297    -0.82   0.410                    -.1257836
               social_friends |  -.0143737   .0496852    -0.29   0.772                    -.0132681
        social_friends_age0_4 |   .0890076     .11337     0.79   0.433                     .0734468
        social_friends_age5_7 |   .0939517   .1036175     0.91   0.365                     .0693361
        social_friends_age8_9 |  -.0443532   .0890562    -0.50   0.619                    -.0314788
      social_friends_age10_14 |  -.0729495   .1055234    -0.69   0.490                    -.0700396
         social_friends_age15 |  -.0214368   .0753041    -0.28   0.776                     -.020518
      social_friends_age16_17 |  -.0213073    .078763    -0.27   0.787                    -.0175979
      social_friends_age18_19 |   .3894557   .1504092     2.59   0.010                     .2321634
      social_friends_age20_24 |   .1433023   .1825209     0.79   0.433                     .0866742
      social_friends_age25_29 |  -.1205388   .1614438    -0.75   0.455                    -.1076675
      social_friends_age45_59 |   .0077889   .1108275     0.07   0.944                     .0065879
      social_friends_age60_64 |  -.0454163   .1181566    -0.38   0.701                    -.0465248
      social_friends_age65_74 |   .2134719   .1569042     1.36   0.174                     .2068913
      social_friends_age75_84 |    .038579   .1306244     0.30   0.768                       .02165
      social_friends_age85_89 |   .0132123    .123618     0.11   0.915                     .0090834
     social_friends_age90over |  -.0448088   .0923547    -0.49   0.628                    -.0410656
          social_friends_male |   .0692944   .0657147     1.05   0.292                     .0520087
  social_friends_ethnic_mixed |  -.0532624    .079089    -0.67   0.501                    -.0386528
  social_friends_ethnic_asian |  -.1161353   .1208954    -0.96   0.337                    -.0656021
  social_friends_ethnic_black |   .1787025   .0910501     1.96   0.050                     .1123616
  social_friends_ethnic_other |  -.0926389   .0782652    -1.18   0.237                    -.0518302
social_friends_country_europe |   .0978036   .0869594     1.12   0.261                     .0477331
 social_friends_country_other |   .0318316   .1284433     0.25   0.804                     .0183469
        social_friends_class1 |  -.0584793   .2958199    -0.20   0.843                    -.0843808
        social_friends_class2 |  -.0416886    .119752    -0.35   0.728                    -.0488622
        social_friends_class3 |  -.1440134   .1876781    -0.77   0.443                    -.2642791
  social_friends_ses_students |  -.4506693   .3407573    -1.32   0.186                    -.2584775
 social_friends_country_ses_8 |   .1242419   .2244259     0.55   0.580                     .0816527
                        _cons |   .0015053   .0275049     0.05   0.956                            .
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. regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
```

```
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic
> _asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_friends social_friends_age0_4 social_friends_age5_7 social_frien
> ds_age8_9 social_friends_age10_14 social_friends_age15 social_friends_age16_17 social_friends_age18_19
social_friends_age20_24 social_friends_age25_29 social_friends_age45_5
> 9 social_friends_age60_64 social_friends_age65_74 social_friends_age75_84 social_friends_age85_89
social_friends_age90over social_friends_male social_friends_ethnic_mixed so
> cial_friends_ethnic_asian social_friends_ethnic_black social_friends_ethnic_other
social_friends_country_europe social_friends_country_other social_friends_class1 social_fri
> ends_class2 social_friends_class3 social_friends_ses_students social_friends_country_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,251
-------------+----------------------------------   F(55, 1195)     =      7.09
       Model |  432.452544        55  7.86277352   Prob > F        =    0.0000
    Residual |  1325.43752     1,195  1.10915274   R-squared       =    0.2460
-------------+----------------------------------   Adj R-squared   =    0.2113
       Total |  1757.89007     1,250  1.40631205   Root MSE        =    1.0532

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                s_medium_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
------------------------------+----------------------------------------------------------------
                       age0_4 |   -.122521   .0795243    -1.54   0.124                 -.101033
                       age5_7 |  -.0447354   .0586119    -0.76   0.445                -.0367801
                       age8_9 |  -.1266186   .0512981    -2.47   0.014                -.1033905
                     age10_14 |  -.0709015   .0622636    -1.14   0.255                -.0584136
                        age15 |   .0043466    .041385     0.11   0.916                 .0036589
                     age16_17 |  -.1087519   .0478298    -2.27   0.023                -.0867832
                     age18_19 |   -.025346   .0833809    -0.30   0.761                -.0134606
                     age20_24 |  -.0980899   .0913133    -1.07   0.283                -.0797843
                     age25_29 |  -.1124428   .1023084    -1.10   0.272                -.0969351
                     age45_59 |  -.1008619   .0707022    -1.43   0.154                -.0837381
                     age60_64 |  -.0645928   .0717359    -0.90   0.368                  -.05441
                     age65_74 |  -.0356071   .0934675    -0.38   0.703                 -.029701
                     age75_84 |   .0022514   .0810687     0.03   0.978                 .0018531
                     age85_89 |   .0648128   .0695241     0.93   0.351                 .0541025
                    age90over |   .1796595   .0549746     3.27   0.001                 .1489972
                         male |  -.0089202   .0404425    -0.22   0.825                -.0075562
                 ethnic_mixed |   .0436396   .0472409     0.92   0.356                 .0388456
                 ethnic_asian |  -.1886639   .0718817    -2.62   0.009                -.1863493
                 ethnic_black |   .0704484   .0518861     1.36   0.175                 .0595443
                 ethnic_other |  -.0422291   .0481648    -0.88   0.381                -.0348617
               country_europe |   .0543964    .051121     1.06   0.288                 .0461866
                country_other |  -.0196451    .084997    -0.23   0.817                -.0178697
                       class1 |   -.359101   .1864572    -1.93   0.054                -.5884707
                       class2 |  -.0793464   .0781702    -1.02   0.310                -.1280264
                       class3 |    -.22499   .1178305    -1.91   0.056                 -.536349
                        ses_8 |   .3307903   .1379357     2.40   0.017                 .2987554
                 ses_students |  -.1815587    .210478    -0.86   0.389                 -.135264
               social_friends |   .0365617   .0556878     0.66   0.512                  .031098
        social_friends_age0_4 |    .074715   .1267273     0.59   0.556                 .0567665
        social_friends_age5_7 |   .1071514   .1157099     0.93   0.355                 .0728192
        social_friends_age8_9 |  -.0324184   .0993334    -0.33   0.744                -.0211976
      social_friends_age10_14 |  -.1203597   .1176707    -1.02   0.307                -.1064947
         social_friends_age15 |  -.0433442   .0845527    -0.51   0.608                -.0382357
      social_friends_age16_17 |   .0276108     .08819     0.31   0.754                 .0210107
      social_friends_age18_19 |    .139476   .1684156     0.83   0.408                 .0766857
      social_friends_age20_24 |   .0892781   .2029688     0.44   0.660                  .049733
      social_friends_age25_29 |  -.2587994   .1812714    -1.43   0.154                  -.21301
      social_friends_age45_59 |  -.1775636   .1237612    -1.43   0.152                -.1383502
      social_friends_age60_64 |  -.1958005   .1320298    -1.48   0.138                -.1849092
      social_friends_age65_74 |   .2223971   .1751191     1.27   0.204                 .1986171
      social_friends_age75_84 |  -.0430462   .1458031    -0.30   0.768                -.0221772
      social_friends_age85_89 |   .0638733   .1378872     0.46   0.643                 .0404002
     social_friends_age90over |  -.1149235   .1028553    -1.12   0.264                -.0970634
          social_friends_male |   .1399615   .0734928     1.90   0.057                 .0966947
  social_friends_ethnic_mixed |  -.0313398   .0879204    -0.36   0.722                -.0209487
  social_friends_ethnic_asian |  -.0228345   .1349016    -0.17   0.866                -.0118932
  social_friends_ethnic_black |   .0362193   .1019743     0.36   0.723                   .02099
  social_friends_ethnic_other |  -.0822234   .0927823    -0.89   0.376                -.0410176
social_friends_country_europe |   .0857104    .097646     0.88   0.380                 .0383549
 social_friends_country_other |   .0227663   .1437165     0.16   0.874                 .0120768
        social_friends_class1 |  -.1731365   .3300575    -0.52   0.600                -.2298606
        social_friends_class2 |   .0250439   .1333165     0.19   0.851                 .0269735
        social_friends_class3 |   -.151346   .2096423    -0.72   0.470                -.2544502
  social_friends_ses_students |  -.3015764   .3800458    -0.79   0.428                -.1592154
 social_friends_country_ses_8 |   -.052515    .250208    -0.21   0.834                 -.031768
                        _cons |   .0340598   .0308358     1.10   0.270                        .
-----------------------------------------------------------------------------------------------

. regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_as
> ian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
social_friends social_friends_age0_4 social_friends_age5_7 social_friends_
> age8_9 social_friends_age10_14 social_friends_age15 social_friends_age16_17 social_friends_age18_19
social_friends_age20_24 social_friends_age25_29 social_friends_age45_59 s
> ocial_friends_age60_64 social_friends_age65_74 social_friends_age75_84 social_friends_age85_89
social_friends_age90over social_friends_male social_friends_ethnic_mixed socia
```

```
> l_friends_ethnic_asian social_friends_ethnic_black social_friends_ethnic_other
social_friends_country_europe social_friends_country_other social_friends_class1 social_friend
> s_class2 social_friends_class3 social_friends_ses_students social_friends_country_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,277
-------------+----------------------------------   F(55, 1221)     =      8.50
       Model |  386.380363        55  7.0250975    Prob > F        =    0.0000
    Residual |  1009.21688     1,221  .826549451   R-squared       =    0.2769
-------------+----------------------------------   Adj R-squared   =    0.2443
       Total |  1395.59724     1,276  1.09372825   Root MSE        =    .90915

------------------------------------------------------------------------------------------------
                  s_low_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-----------------------------+------------------------------------------------------------------
                      age0_4 |  -.1281078   .0678665    -1.89   0.059                -.1204727
                      age5_7 |  -.0096484   .0501702    -0.19   0.848                -.0090016
                      age8_9 |  -.0600022   .0440184    -1.36   0.173                -.0554833
                    age10_14 |  -.1412228   .0530665    -2.66   0.008                -.1321982
                       age15 |  -.0127523   .0352179    -0.36   0.717                -.0121868
                    age16_17 |  -.0094277   .0409242    -0.23   0.818                 -.008508
                    age18_19 |   -.069491   .0714793    -0.97   0.331                -.0415864
                    age20_24 |   .0038699   .0781257     0.05   0.961                 .0035562
                    age25_29 |   -.107965   .0865412    -1.25   0.212                 -.105822
                    age45_59 |  -.0677306   .0604452    -1.12   0.263                 -.063969
                    age60_64 |  -.0541122   .0612097    -0.88   0.377                -.0516946
                    age65_74 |  -.0536104   .0799567    -0.67   0.503                 -.050705
                    age75_84 |   .0871168   .0693347     1.26   0.209                 .0813921
                    age85_89 |   .1056413    .059412     1.78   0.076                 .1001209
                   age90over |   .1044792   .0470321     2.22   0.027                 .0982149
                        male |  -.0636452   .0346035    -1.84   0.066                -.0609483
                ethnic_mixed |  -.0092432   .0405035    -0.23   0.820                -.0093187
                ethnic_asian |  -.1170117   .0612102    -1.91   0.056                 -.129973
                ethnic_black |   .1197379    .044453     2.69   0.007                  .114117
                ethnic_other |  -.0304545   .0372883    -0.82   0.414                -.0303695
              country_europe |   .0742476   .0434873     1.71   0.088                 .0712701
               country_other |   -.051613   .0720408    -0.72   0.474                -.0530079
                      class1 |  -.3723575   .1590192    -2.34   0.019                -.6914755
                      class2 |  -.1028121   .0667998    -1.54   0.124                -.1880745
                      class3 |  -.2381863   .1004055    -2.37   0.018                -.6469618
                       ses_8 |   .2104989    .117153     1.80   0.073                 .2155865
                ses_students |  -.3027767   .1795171    -1.69   0.092                -.2551458
              social_friends |  -.0345722    .047537    -0.73   0.467                -.0330576
       social_friends_age0_4 |   .1530445   .1084682     1.41   0.159                 .1308181
       social_friends_age5_7 |   .0969368   .0991374     0.98   0.328                 .0741052
       social_friends_age8_9 |  -.0228444   .0852056    -0.27   0.789                -.0167949
     social_friends_age10_14 |  -.0604335   .1009608    -0.60   0.550                -.0601041
        social_friends_age15 |  -.0225273   .0720482    -0.31   0.755                -.0223352
     social_friends_age16_17 |   .0171041   .0753575     0.23   0.820                 .0146331
     social_friends_age18_19 |   .2451531   .1439059     1.70   0.089                 .1513832
     social_friends_age20_24 |   .0644763   .1746292     0.37   0.712                 .0403963
     social_friends_age25_29 |  -.0186633   .1544634    -0.12   0.904                -.0172683
     social_friends_age45_59 |   .0868559   .1060357     0.82   0.413                 .0760987
     social_friends_age60_64 |  -.1259895   .1130478    -1.11   0.265                 -.133694
     social_friends_age65_74 |   .2461085   .1501201     1.64   0.101                 .2470773
     social_friends_age75_84 |   .0450777   .1249766     0.36   0.718                 .0262044
     social_friends_age85_89 |   .0533188   .1182731     0.45   0.652                 .0379713
    social_friends_age90over |  -.0514596   .0883616    -0.58   0.560                -.0488524
         social_friends_male |   .0768833   .0628734     1.22   0.222                 .0597743
 social_friends_ethnic_mixed |  -.0154712   .0756694    -0.20   0.838                -.0116303
 social_friends_ethnic_asian |  -.0626401   .1156682    -0.54   0.588                -.0366531
 social_friends_ethnic_black |   .0477103   .0871133     0.55   0.584                 .0310745
 social_friends_ethnic_other |  -.0510025   .0748812    -0.68   0.496                -.0295588
social_friends_country_europe |   .0595414   .0831995    0.72   0.474                 .0301015
 social_friends_country_other |   .1338519   .1228898    1.09   0.276                 .0799158
       social_friends_class1 |  -.2615116   .2830295    -0.92   0.356                -.3908739
       social_friends_class2 |   -.048004   .1145743    -0.42   0.675                -.0582825
       social_friends_class3 |  -.2096773   .1795634    -1.17   0.243                -.3985805
 social_friends_ses_students |  -.5648511   .3260239    -1.73   0.083                -.3355857
 social_friends_country_ses_8 |  -.0648342   .2147223   -0.30   0.763                -.0441379
                       _cons |   .0171392   .0263157     0.65   0.515                        .
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. regress s_total_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_
> asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
same_area_friends same_area_friends_age0_4 same_area_friends_age5_7 same
> _area_friends_age8_9 same_area_friends_age10_14 same_area_friends_age15 same_area_friends_age16_17
same_area_friends_age18_19 same_area_friends_age20_24 same_area_friends_ag
> e25_29 same_area_friends_age45_59 same_area_friends_age60_64 same_area_friends_age65_74
same_area_friends_age75_84 same_area_friends_age85_89 same_area_friends_age90over sam
> e_area_friends_male same_area_friends_ethnic_mixed same_area_friends_ethnic_asian
same_area_friends_ethnic_black same_area_friends_ethnic_other same_area_friends_country_eur
> ope same_area_friends_country_other same_area_friends_class1 same_area_friends_class2
same_area_friends_class3 same_area_friends_ses_students same_area_friends_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,408
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-------------+----------------------------------   F(55, 1352)     =      9.56
       Model |  500.759596        55  9.10471992   Prob > F        =    0.0000
    Residual |  1287.21372     1,352  .952081155   R-squared       =    0.2801
-------------+----------------------------------   Adj R-squared   =    0.2508
       Total |  1787.97332     1,407  1.27076995   Root MSE        =    .97575

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                    s_total_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
---------------------------------+---------------------------------------------------------------
                          age0_4 |  -.0736858   .0697109    -1.06   0.291                -.0650145
                          age5_7 |  -.0649259   .0508173    -1.28   0.202                -.0573733
                          age8_9 |  -.0740792   .0441403    -1.68   0.094                -.0654553
                        age10_14 |  -.1291287   .0546827    -2.36   0.018                -.1151291
                           age15 |   .0543093   .0355043     1.53   0.126                 .0480861
                        age16_17 |  -.0642687   .0420543    -1.53   0.127                -.0551767
                        age18_19 |   -.126212   .0470211    -2.68   0.007                -.1100396
                        age20_24 |   .0172508   .0781897     0.22   0.825                 .0158409
                        age25_29 |  -.1297182   .0844239    -1.54   0.125                -.1193047
                        age45_59 |  -.0442818   .0619939    -0.71   0.475                 -.039452
                        age60_64 |   .0092169   .0630374     0.15   0.884                 .0081823
                        age65_74 |  -.1134027   .0827533    -1.37   0.171                -.0989308
                        age75_84 |   .0567169   .0710538     0.80   0.425                 .0489032
                        age85_89 |   .0986794   .0613829     1.61   0.108                 .0873337
                       age90over |   .1372828   .0482771     2.84   0.005                 .1206904
                            male |  -.0562559    .032785    -1.72   0.086                  -.05324
                    ethnic_mixed |   .0417849   .0411667     1.02   0.310                 .0395173
                    ethnic_asian |  -.1544179   .0694723    -2.22   0.026                -.1636971
                    ethnic_black |   .0957667   .0457466     2.09   0.036                 .0898595
                    ethnic_other |  -.0598442   .0392129    -1.53   0.127                -.0555349
                  country_europe |   .0969281   .0409762     2.37   0.018                 .0910299
                   country_other |   .0628629   .0954056     0.66   0.510                 .0604199
                          class1 |  -.2268106   .1573966    -1.44   0.150                 -.393325
                          class2 |  -.0302495     .06709    -0.45   0.652                -.0522741
                          class3 |  -.1434178   .0996548    -1.44   0.150                -.3638503
                           ses_8 |   .3263924   .1149471     2.84   0.005                 .3236646
                    ses_students |  -.1229345   .1774374    -0.69   0.489                -.1112787
               same_area_friends |   .0120739   .0275265     0.44   0.661                  .010721
        same_area_friends_age0_4 |  -.0573694   .0716148    -0.80   0.423                -.0501838
        same_area_friends_age5_7 |  -.0457774    .051148    -0.90   0.371                -.0400876
        same_area_friends_age8_9 |   .0463187   .0470564     0.98   0.325                 .0415598
      same_area_friends_age10_14 |  -.0349147   .0570064    -0.61   0.540                -.0304388
         same_area_friends_age15 |  -.0216255   .0371281    -0.58   0.560                -.0185411
      same_area_friends_age16_17 |  -.0044744   .0475491    -0.09   0.925                -.0034882
      same_area_friends_age18_19 |  -.0333467    .064816    -0.51   0.607                -.0219569
      same_area_friends_age20_24 |  -.1267853   .0811991    -1.56   0.119                -.1229381
      same_area_friends_age25_29 |  -.1468616   .0840589    -1.75   0.081                -.1424006
      same_area_friends_age45_59 |  -.1903153   .0616313    -3.09   0.002                -.1756396
      same_area_friends_age60_64 |  -.0479168   .0634978    -0.75   0.451                -.0439116
      same_area_friends_age65_74 |  -.0415795   .0836819    -0.50   0.619                -.0370526
      same_area_friends_age75_84 |  -.0737335   .0718064    -1.03   0.305                 -.062819
      same_area_friends_age85_89 |   .0409628   .0645576     0.63   0.526                 .0348821
     same_area_friends_age90over |  -.1043009    .048908    -2.13   0.033                -.0909011
          same_area_friends_male |  -.0235688   .0346631    -0.68   0.497                -.0215241
  same_area_friends_ethnic_mixed |  -.0594896   .0395762    -1.50   0.133                -.0580017
  same_area_friends_ethnic_asian |    -.08152   .0702393    -1.16   0.246                -.0898047
  same_area_friends_ethnic_black |   .0452941   .0445888     1.02   0.310                 .0459585
  same_area_friends_ethnic_other |   .0215945   .0380863     0.57   0.571                 .0222261
same_area_friends_country_europe |   .0171671    .037474     0.46   0.647                  .018742
 same_area_friends_country_other |    .081423   .0966238     0.84   0.400                 .0825867
        same_area_friends_class1 |  -.2407861   .1530859    -1.57   0.116                -.4179063
        same_area_friends_class2 |  -.0904741   .0662921    -1.36   0.173                -.1615091
        same_area_friends_class3 |  -.1433917   .0963282    -1.49   0.137                -.3558159
  same_area_friends_ses_students |  -.2151108   .1743796    -1.23   0.218                -.1986536
         same_area_friends_ses_8 |  -.1801007   .1151872    -1.56   0.118                -.1814259
                           _cons |   .0027061   .0269184     0.10   0.920                        .
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. regress s_high_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_a
> sian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
same_area_friends same_area_friends_age0_4 same_area_friends_age5_7 same_
> area_friends_age8_9 same_area_friends_age10_14 same_area_friends_age15 same_area_friends_age16_17
same_area_friends_age18_19 same_area_friends_age20_24 same_area_friends_age
> 25_29 same_area_friends_age45_59 same_area_friends_age60_64 same_area_friends_age65_74
same_area_friends_age75_84 same_area_friends_age85_89 same_area_friends_age90over same
> _area_friends_male same_area_friends_ethnic_mixed same_area_friends_ethnic_asian
same_area_friends_ethnic_black same_area_friends_ethnic_other same_area_friends_country_euro
> pe same_area_friends_country_other same_area_friends_class1 same_area_friends_class2
same_area_friends_class3 same_area_friends_ses_students same_area_friends_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,408
-------------+----------------------------------   F(55, 1352)     =      8.70
       Model |  448.591158        55  8.15620288   Prob > F        =    0.0000
    Residual |  1267.08889     1,352  .937195928   R-squared       =    0.2615
-------------+----------------------------------   Adj R-squared   =    0.2314
       Total |  1715.68005     1,407  1.21938881   Root MSE        =    .96809
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                     s_high_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
---------------------------------+--------------------------------------------------------
                          age0_4 |  -.0495983   .0691638    -0.72   0.473                -.0446741
                          age5_7 |  -.0714959   .0504185    -1.42   0.156                -.0644963
                          age8_9 |   -.081964   .0437939    -1.87   0.061                -.0739323
                        age10_14 |  -.1066222   .0542536    -1.97   0.050                -.0970448
                           age15 |   .0593485   .0352257     1.68   0.092                 .0536435
                        age16_17 |  -.0844674   .0417242    -2.02   0.043                  -.07403
                        age18_19 |  -.1286675   .0466521    -2.76   0.006                -.1145195
                        age20_24 |  -.0135264   .0775761    -0.17   0.862                -.0126799
                        age25_29 |  -.1413803   .0837613    -1.69   0.092                -.1327419
                        age45_59 |  -.0191629   .0615074    -0.31   0.755                -.0174288
                        age60_64 |   .0180209   .0625427     0.29   0.773                 .0163317
                        age65_74 |  -.1389881   .0821039    -1.69   0.091                -.1237794
                        age75_84 |   .0434408   .0704962     0.62   0.538                 .0382371
                        age85_89 |   .0610892   .0609012     1.00   0.316                 .0551927
                       age90over |   .1251696   .0478982     2.61   0.009                 .1123357
                            male |  -.0497576   .0325277    -1.53   0.126                -.0480719
                    ethnic_mixed |   .1034608   .0408436     2.53   0.011                 .0998864
                    ethnic_asian |  -.0336724   .0689271    -0.49   0.625                -.0364401
                    ethnic_black |   .1414717   .0453876     3.12   0.002                 .1355132
                    ethnic_other |  -.0259495   .0389052    -0.67   0.505                 -.024583
                  country_europe |   .0581814   .0406546     1.43   0.153                 .0557803
                   country_other |  -.0515975   .0946569    -0.55   0.586                -.0506263
                          class1 |  -.1107211   .1561614    -0.71   0.478                -.1960112
                          class2 |   .0108216   .0665635     0.16   0.871                 .0190908
                          class3 |  -.0676951   .0988728    -0.68   0.494                -.1753232
                           ses_8 |   .3720426    .114045     3.26   0.001                 .3766259
                    ses_students |   .0302084   .1760448     0.17   0.864                 .0279144
               same_area_friends |  -.0053199   .0273104    -0.19   0.846                -.0048223
        same_area_friends_age0_4 |  -.0339099   .0710527    -0.48   0.633                -.0302811
        same_area_friends_age5_7 |  -.0334255   .0507466    -0.66   0.510                -.0298812
        same_area_friends_age8_9 |   .0561741   .0466871     1.20   0.229                 .0514535
      same_area_friends_age10_14 |  -.0338206    .056559    -0.60   0.550                -.0300997
         same_area_friends_age15 |  -.0144695   .0368367    -0.39   0.695                -.0126644
      same_area_friends_age16_17 |   .0010434   .0471759     0.02   0.982                 .0008304
      same_area_friends_age18_19 |  -.0408449   .0643074    -0.64   0.525                -.0274548
      same_area_friends_age20_24 |  -.1042005   .0805618    -1.29   0.196                -.1031455
      same_area_friends_age25_29 |  -.1426513   .0833992    -1.71   0.087                -.1412022
      same_area_friends_age45_59 |  -.1623078   .0611476    -2.65   0.008                -.1529151
      same_area_friends_age60_64 |  -.0476492   .0629995    -0.76   0.450                -.0445769
      same_area_friends_age65_74 |  -.0245413   .0830252    -0.30   0.768                -.0223254
      same_area_friends_age75_84 |  -.0720033   .0712428    -1.01   0.312                 -.062624
      same_area_friends_age85_89 |   .0366058    .064051     0.57   0.568                 .0318219
     same_area_friends_age90over |  -.0709255   .0485242    -1.46   0.144                -.0631023
          same_area_friends_male |  -.0085234   .0343911    -0.25   0.804                -.0079463
  same_area_friends_ethnic_mixed |  -.0464899   .0392656    -1.18   0.237                -.0462723
  same_area_friends_ethnic_asian |  -.0778922   .0696881    -1.12   0.264                -.0875974
  same_area_friends_ethnic_black |   .0386182   .0442388     0.87   0.383                 .0400016
  same_area_friends_ethnic_other |    .030286   .0377874     0.80   0.423                 .0318217
same_area_friends_country_europe |   .0231238   .0371799     0.62   0.534                 .0257715
 same_area_friends_country_other |   .0637082   .0958655     0.66   0.506                  .065966
        same_area_friends_class1 |  -.2601866   .1518845    -1.71   0.087                -.4609935
        same_area_friends_class2 |   -.095888   .0657719    -1.46   0.145                -.1747427
        same_area_friends_class3 |  -.1543646   .0955722    -1.62   0.107                -.3910312
  same_area_friends_ses_students |   -.217996    .173011    -1.26   0.208                -.2055158
         same_area_friends_ses_8 |  -.1939382   .1142832    -1.70   0.090                -.1994388
                           _cons |   .0083328   .0267071     0.31   0.755                        .
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. regress s_medium_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic
> _asian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
same_area_friends same_area_friends_age0_4 same_area_friends_age5_7 sam
> e_area_friends_age8_9 same_area_friends_age10_14 same_area_friends_age15 same_area_friends_age16_17
same_area_friends_age18_19 same_area_friends_age20_24 same_area_friends_a
> ge25_29 same_area_friends_age45_59 same_area_friends_age60_64 same_area_friends_age65_74
same_area_friends_age75_84 same_area_friends_age85_89 same_area_friends_age90over sa
> me_area_friends_male same_area_friends_ethnic_mixed same_area_friends_ethnic_asian
same_area_friends_ethnic_black same_area_friends_ethnic_other same_area_friends_country_eu
> rope same_area_friends_country_other same_area_friends_class1 same_area_friends_class2
same_area_friends_class3 same_area_friends_ses_students same_area_friends_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,381
-------------+----------------------------------   F(55, 1325)     =      8.81
       Model |  519.697534        55  9.44904606   Prob > F        =    0.0000
    Residual |  1420.64732     1,325  1.07218666   R-squared       =    0.2678
-------------+----------------------------------   Adj R-squared   =    0.2374
       Total |  1940.34486     1,380    1.406047   Root MSE        =    1.0355

------------------------------------------------------------------------------------------
                   s_medium_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
---------------------------------+--------------------------------------------------------
                          age0_4 |  -.0751292   .0747873    -1.00   0.315                -.0627327
                          age5_7 |  -.0729369   .0543165    -1.34   0.180                -.0612668
                          age8_9 |  -.0894381   .0471143    -1.90   0.058                -.0751936
```

```
                   age10_14 |   -.083774   .0586274    -1.43   0.153                -.0708262
                      age15 |    .041467   .0380938     1.09   0.277                 .0348358
                   age16_17 |  -.0714017   .0449633    -1.59   0.113                 -.058423
                   age18_19 |  -.1052186   .0501269    -2.10   0.036                -.0879261
                   age20_24 |  -.0580499    .083694    -0.69   0.488                -.0508925
                   age25_29 |  -.0242578   .0912072    -0.27   0.790                -.0211754
                   age45_59 |  -.0551645   .0663909    -0.83   0.406                -.0466748
                   age60_64 |  -.0180006   .0676016    -0.27   0.790                -.0151702
                   age65_74 |   -.013977   .0888587    -0.16   0.875                -.0115331
                   age75_84 |   .0019608   .0760873     0.03   0.979                 .0016034
                   age85_89 |   .0601339   .0657063     0.92   0.360                 .0505739
                  age90over |   .2152623   .0517316     4.16   0.000                 .1800695
                       male |  -.0274334   .0350594    -0.78   0.434                -.0247784
               ethnic_mixed |   .0571385   .0440049     1.30   0.194                 .0514628
               ethnic_asian |  -.2177349   .0750293    -2.90   0.004                -.2211565
               ethnic_black |   .0282975   .0490974     0.58   0.564                 .0253843
               ethnic_other |  -.0448464   .0443139    -1.01   0.312                -.0373976
             country_europe |   .0732732   .0444658     1.65   0.100                 .0656394
              country_other |   .0511575   .1031433     0.50   0.620                 .0469239
                     class1 |  -.3242915   .1684675    -1.92   0.054                -.5352472
                     class2 |  -.0657169     .07179    -0.92   0.360                -.1081104
                     class3 |  -.1954926   .1066817    -1.83   0.067                -.4696131
                      ses_8 |   .3128109   .1235122     2.53   0.011                  .295275
               ses_students |  -.1488181   .1900416    -0.78   0.434                 -.128605
          same_area_friends |   .0250038   .0295028     0.85   0.397                 .0210855
     same_area_friends_age0_4 |  -.0907444    .077504    -1.17   0.242                -.0745812
     same_area_friends_age5_7 |  -.0201118   .0548282    -0.37   0.714                -.0166559
     same_area_friends_age8_9 |   .0174562   .0503456     0.35   0.729                 .0148791
   same_area_friends_age10_14 |  -.0750008    .061475    -1.22   0.223                -.0618427
      same_area_friends_age15 |  -.0277823   .0400164    -0.69   0.488                -.0224482
   same_area_friends_age16_17 |  -.0096392   .0508589    -0.19   0.850                -.0071753
   same_area_friends_age18_19 |   .0051238   .0693842     0.07   0.941                 .0032288
   same_area_friends_age20_24 |  -.1900155   .0869641    -2.18   0.029                 -.175761
   same_area_friends_age25_29 |  -.1101766   .0915262    -1.20   0.229                -.1011645
   same_area_friends_age45_59 |  -.1276597   .0662059    -1.93   0.054                -.1114152
   same_area_friends_age60_64 |  -.0272881   .0678201    -0.40   0.687                -.0236968
   same_area_friends_age65_74 |  -.1689552   .0898983    -1.88   0.060                 -.141765
   same_area_friends_age75_84 |  -.0438548   .0763938    -0.57   0.566                -.0353722
   same_area_friends_age85_89 |  -.0063591   .0695503    -0.09   0.927                -.0051429
  same_area_friends_age90over |  -.0830844   .0521779    -1.59   0.112                -.0690723
      same_area_friends_male |  -.0106184   .0369946    -0.29   0.774                -.0092474
same_area_friends_ethnic_mixed |  -.0962822   .0424718    -2.27   0.024                -.0888527
same_area_friends_ethnic_asian |  -.0708464   .0749074    -0.95   0.344                -.0747883
same_area_friends_ethnic_black |   .0232336   .0475293     0.49   0.625                 .0225083
same_area_friends_ethnic_other |    .015198   .0438573     0.35   0.729                 .0139793
same_area_friends_country_europe |  -.0084704   .0406309    -0.21   0.835                -.0088264
same_area_friends_country_other |   .0601367    .103196     0.58   0.560                 .0582226
     same_area_friends_class1 |  -.2373485   .1648756    -1.44   0.150                -.3926754
     same_area_friends_class2 |   -.102914   .0713424    -1.44   0.149                -.1750167
     same_area_friends_class3 |  -.1405291   .1038064    -1.35   0.176                -.3304246
same_area_friends_ses_students |   -.186322   .1877459    -0.99   0.321                -.1640477
      same_area_friends_ses_8 |  -.1384553   .1240735    -1.12   0.265                -.1330894
                      _cons |   .0249344   .0288368     0.86   0.387                        .
-------------------------------------------------------------------------------------------------

. regress s_low_jnsn age0_4 age5_7 age8_9 age10_14 age15 age16_17 age18_19 age20_24 age25_29 age45_59
age60_64 age65_74 age75_84 age85_89 age90over male ethnic_mixed ethnic_as
> ian ethnic_black ethnic_other country_europe country_other class1 class2 class3 ses_8 ses_students
same_area_friends same_area_friends_age0_4 same_area_friends_age5_7 same_a
> rea_friends_age8_9 same_area_friends_age10_14 same_area_friends_age15 same_area_friends_age16_17
same_area_friends_age18_19 same_area_friends_age20_24 same_area_friends_age2
> 5_29 same_area_friends_age45_59 same_area_friends_age60_64 same_area_friends_age65_74
same_area_friends_age75_84 same_area_friends_age85_89 same_area_friends_age90over same_
> area_friends_male same_area_friends_ethnic_mixed same_area_friends_ethnic_asian
same_area_friends_ethnic_black same_area_friends_ethnic_other same_area_friends_country_europ
> e same_area_friends_country_other same_area_friends_class1 same_area_friends_class2
same_area_friends_class3 same_area_friends_ses_students same_area_friends_ses_8, b

      Source |       SS           df       MS      Number of obs   =     1,408
-------------+----------------------------------   F(55, 1352)     =      9.88
       Model |  440.993669        55  8.01806671   Prob > F        =    0.0000
    Residual |  1096.91225     1,352   .81132563   R-squared       =    0.2867
-------------+----------------------------------   Adj R-squared   =    0.2577
       Total |  1537.90592     1,407  1.09303903   Root MSE        =    .90074

-------------------------------------------------------------------------------------------------
                 s_low_jnsn |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------------------------+-----------------------------------------------------------------
                     age0_4 |  -.0529525   .0643519    -0.82   0.411                -.0503766
                     age5_7 |  -.0565263   .0469107    -1.20   0.228                -.0538589
                     age8_9 |  -.0336931    .040747    -0.83   0.408                   -.0321
                   age10_14 |  -.1440567    .050479    -2.85   0.004                -.1384877
                      age15 |   .0504259   .0327749     1.54   0.124                 .0481409
                   age16_17 |  -.0307986   .0388214    -0.79   0.428                -.0285103
                   age18_19 |  -.0969556   .0434064    -2.23   0.026                -.0911458
                   age20_24 |   .0423394   .0721789     0.59   0.558                 .0419209
                   age25_29 |  -.1105677   .0779338    -1.42   0.156                -.1096479
```

age45_59	-.0727588	.0572282	-1.27	0.204	-.0698948
age60_64	-.0170635	.0581914	-0.29	0.769	-.0163333
age65_74	-.0945958	.0763917	-1.24	0.216	-.0889807
age75_84	.0683484	.0655915	1.04	0.298	.0635431
age85_89	.1410681	.0566641	2.49	0.013	.1346169
age90over	.1159228	.0445658	2.60	0.009	.1098857
male	-.0651279	.0302647	-2.15	0.032	-.0664588
ethnic_mixed	-.0229963	.038002	-0.61	0.545	-.0234499
ethnic_asian	-.1424133	.0641317	-2.22	0.027	-.1627831
ethnic_black	.0899357	.0422298	2.13	0.033	.0909908
ethnic_other	-.0583311	.0361984	-1.61	0.107	-.058366
country_europe	.104264	.0378261	2.76	0.006	.1055806
country_other	.0278069	.0880713	0.32	0.752	.0288174
class1	-.2892661	.1452968	-1.99	0.047	-.5408804
class2	-.0562151	.0619325	-0.91	0.364	-.1047461
class3	-.1764474	.0919939	-1.92	0.055	-.4826704
ses_8	.2055502	.1061106	1.94	0.053	.2197803
ses_students	-.2365783	.1637969	-1.44	0.149	-.2309025
same_area_friends	.0159584	.0254104	0.63	0.530	.015279
same_area_friends_age0_4	-.0598571	.0661094	-0.91	0.365	-.0564566
same_area_friends_age5_7	-.051638	.047216	-1.09	0.274	-.0487576
same_area_friends_age8_9	.0507933	.0434389	1.17	0.242	.0491404
same_area_friends_age10_14	-.0347244	.052624	-0.66	0.509	-.0326414
same_area_friends_age15	-.0297159	.0342739	-0.87	0.386	-.027471
same_area_friends_age16_17	.0275637	.0438938	0.63	0.530	.0231695
same_area_friends_age18_19	-.032806	.0598333	-0.55	0.584	-.023291
same_area_friends_age20_24	-.0727046	.0749569	-0.97	0.332	-.0760143
same_area_friends_age25_29	-.129564	.0775969	-1.67	0.095	-.1354576
same_area_friends_age45_59	-.1596957	.0568934	-2.81	0.005	-.1589123
same_area_friends_age60_64	-.0512433	.0586164	-0.87	0.382	-.0506343
same_area_friends_age65_74	-.0211936	.0772489	-0.27	0.784	-.0203638
same_area_friends_age75_84	-.0662396	.0662863	-1.00	0.318	-.0608498
same_area_friends_age85_89	.0311787	.0595948	0.52	0.601	.0286278
same_area_friends_age90over	-.0945876	.0451482	-2.10	0.036	-.0888855
same_area_friends_male	-.0349386	.0319984	-1.09	0.275	-.034404
same_area_friends_ethnic_mixed	-.0471239	.0365338	-1.29	0.197	-.04954
same_area_friends_ethnic_asian	-.0758508	.0648397	-1.17	0.242	-.0900971
same_area_friends_ethnic_black	.0471461	.041161	1.15	0.252	.0515805
same_area_friends_ethnic_other	-.002459	.0351584	-0.07	0.944	-.0027289
same_area_friends_country_europe	.0172702	.0345932	0.50	0.618	.0203297
same_area_friends_country_other	.0614964	.0891959	0.69	0.491	.0672555
same_area_friends_class1	-.1637036	.1413175	-1.16	0.247	-.3063524
same_area_friends_class2	-.0636916	.0611959	-1.04	0.298	-.1225944
same_area_friends_class3	-.0956661	.0889229	-1.08	0.282	-.2559617
same_area_friends_ses_students	-.1633847	.1609742	-1.01	0.310	-.1626901
same_area_friends_ses_8	-.1097315	.1063322	-1.03	0.302	-.1191876
_cons	.0103074	.024849	0.41	0.678	.

Appendix I

British Paramedic Journal Editorial

british paramedic journal

COLLEGE OF paramedics
leading the development of the paramedic profession

Editorial

John Martin
Chair of the College of Paramedics

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In recent weeks, Professor Richard Thaler has been awarded the Nobel prize in economics for his work on behavioural insights (*BBC News*, 2017). He is known for demonstrating how 'nudging' may help people to exercise better self-control in the choices they make (see Thaler & Sunstein, 2009).

In the majority of settings in which paramedics operate there has been increasing use in recent years. This is clearly seen in NHS ambulance services, with the National Audit Office (2017) recently reporting an average 5.2% annual growth rate since 2011. The other contexts in which paramedics operate such as primary care, 111 and minor-injuries units are also experiencing this increase in demand. The size of increase in demand cannot be explained by either population growth or changes in acuity. So what is causing this difference in population behaviour and can anything change it?

Andersen (1968) published a health belief model which identified different factors that may contribute to the decisions we make. This considered that when we have a health need, our own health beliefs affect how we choose to act. Toloo et al. (2011) more recently published a theoretical model for emergency service utilisation that built on various models and identified self efficacy and social network as factors contributing to use (see Figure 1).

Self efficacy is the extent to which people believe they are capable of undertaking behaviours to attain a goal. In the case of behaviour in relation to an urgent healthcare need, self efficacy would play a part in what options are chosen. Another aspect to consider in relation to this demand change is the culture in which we live. Frank Furedi, a professor of sociology, has published on our increasing obsession with theoretical risks and the panic this induces when faced with the risk (Furedi, 2006). Utilising a paramedic could be a core response to panic, and we are trained to manage these situations effectively. The environment now also includes living in a time when expectation is increasing: we can expect to shop 24/7,

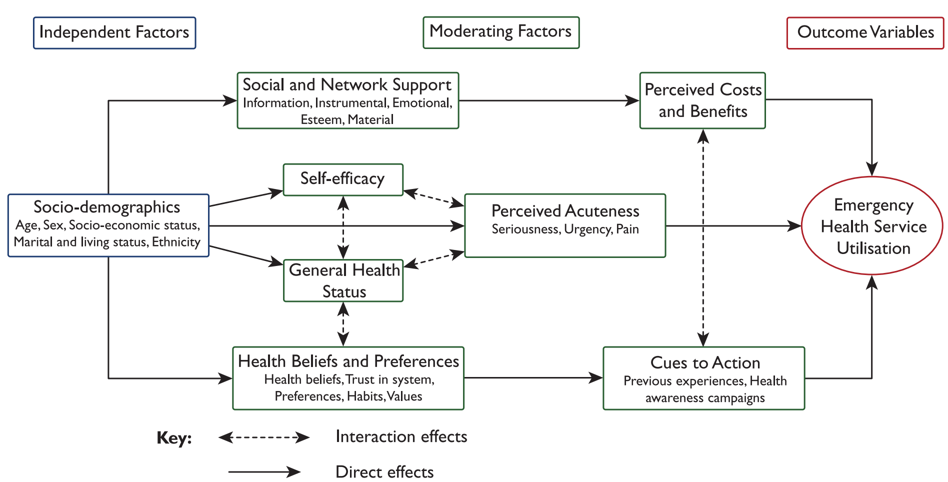

Figure 1. Integrated theoretical model of demand for emergency health services.

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order items online to arrive immediately. Does this follow then that we expect more from our healthcare services to reflect the rest of our consumerism? Instead of waiting to see a primary care physician the following day, is it reasonable to want an immediate response provided by a paramedic?

The solution to managing this increase in workload in the past has often been media campaigns focusing on why we should use healthcare services wisely as a society.

But has this made the required impact? The 'nudge' philosophy outlines that we make irrational choices, so in the moment of requiring a paramedic can we change this? If self efficacy and networks can contribute to the choice we make, is it this that we need to focus on? Could we build communities and people who act differently when presented with the problem?

And what about our behaviour as paramedics? Do we understand why our patients have chosen to utilise us? How can we support them with future decision making?

Maybe it is time to re-think paramedic utilisation?

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